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Issue 17 – February 2004

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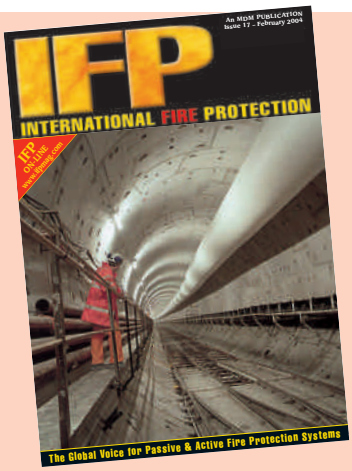

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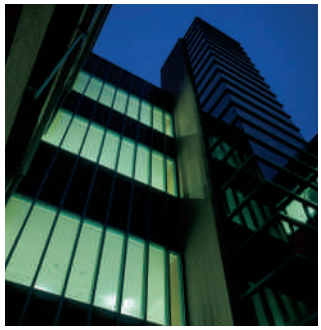
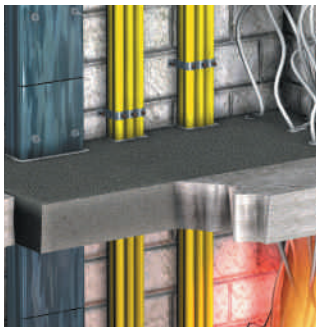
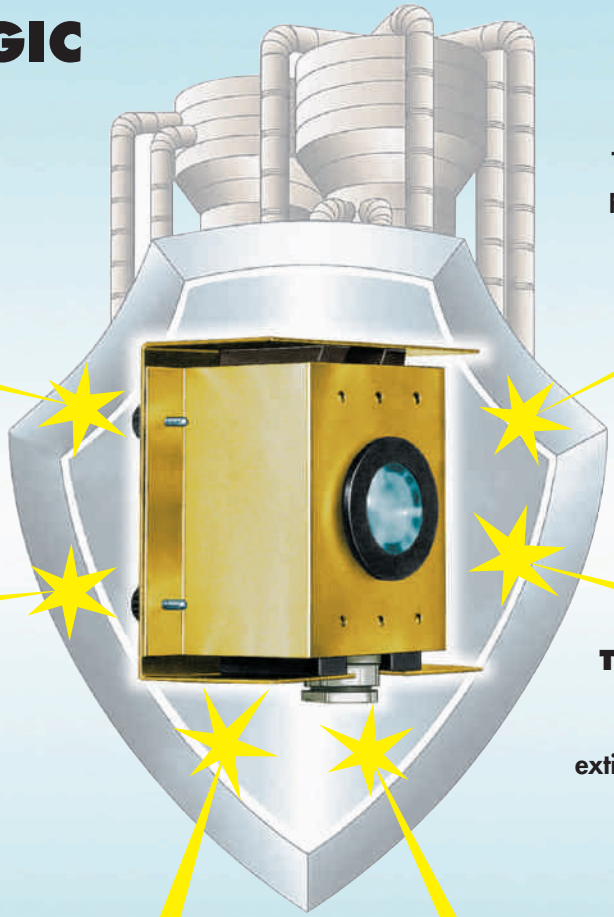




CONTROL LOGIC Spark detector

designed for dust collection systems to protect storage silos from the risk of fire.



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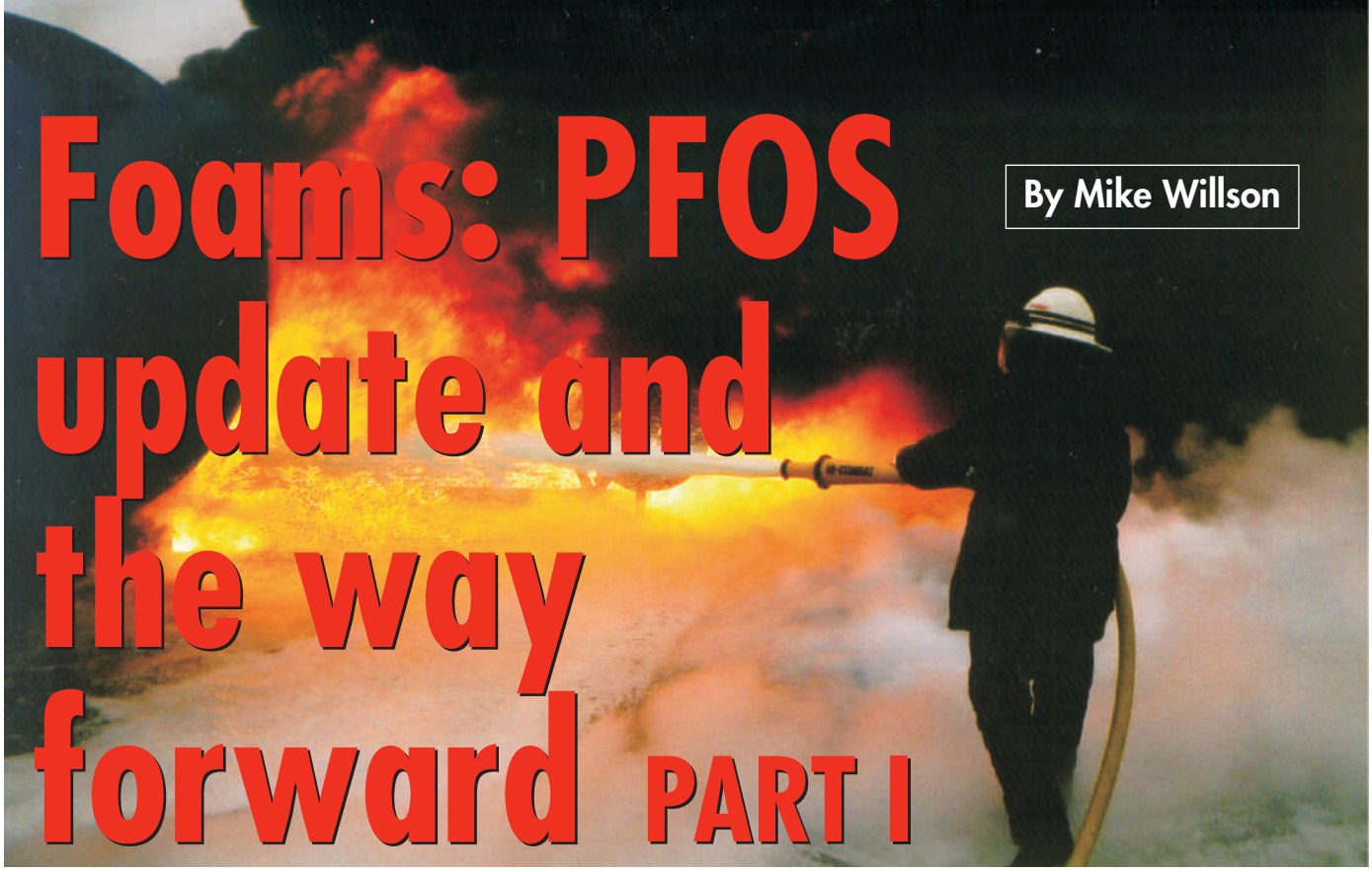
Foams: PFOS update and the way forward PART I

By Mike Willson



The latest high performance Niagara foam from Angus Fire in action. Its polymer free multipurpose application gives fast knockdown on hydrocarbon and polar solvent fuels

MANY FOAM USERS have been sitting tight since 3M suddenly announced their withdrawal from Fluorocarbon surfactant and fire fighting foam manufacture over 3 years ago due to environmental concerns about PFOS (PerFluroOctanyl Sulphonate), a breakdown product of their foams. Many are still wondering what they should do to be certain they select a supplier who has similar capabilities in terms of an extensive high performance product range, well tried and tested products, innovation that will support their needs into the future, technical product support that will answer technical and applications problems for them, detailed material safety information, foam testing facilities to check their foams are still in good condition, emergency foam stocks and an effective 24 hour, 365 days global emergency response service that has been proven to work, but has no PFOS present.

Many foam users now need to review their foam stocks and order new product from a different supplier. Carrying out a supplier audit to determine the manufacturer you wish to rely on and work with into the future is a more important decision even than choosing the right product. Once selected the manufacturer should work in partnership with you to assist with effective product selection to meet your needs, ensuring that the most appropriate product(s) are being used to meet all your flammable liquid hazards and foam applications on site. We'll come back to this, but meanwhile there have been important developments that will give all foam users the confidence to check out new suppliers, look for replacements of PFOS containing foams and verify whether the ones they are currently using are suitable for continued use into the future.

PFOS UPDATE

Most readers will know that PFOS was the persistent, bioaccumulative and toxic breakdown product and ingredient in some 3M fire fighting foams that caused them in May 2000 to announce their withdrawal from producing this range of fluorosurfactant chemicals (concluded in Dec 2002).

They used the ElectroChemical Fluorination (ECF) or Simon Cell method to produce their fluorochemicals and generate PFOS ($CnF_{2n}+1SO_3$ – M+, with M+ being any cationic counter-ion) and numerous derivitatives. The perfluoroctanyl (C_8) chemistry principally is now considered a Persistent, Bio-accumulative and Toxic (PBT) chemical. Other associated chemicals the PFOA (PerFluoro Octanoic Acids) group, are also under investigation by the Environmental Protection Agency (EPA) in USA as potentially harmful products.

TELOMERISATION

However the second major industrial process used to make fluorochemicals is Telomerisation, a process that was developed and is currently used by DuPont and others to synthesize fluorotelomer-based products. These fluorotelomer-based products contain neither PFOS nor any of its derivatives, and does not contain PFOA either. PFOS is neither manufactured nor is it a by-product of this fluorotelomer-based chemistry.

PFOA (perfluorooctanoic acid, $CnF_{2n}+1COO$ – M+, with M+ being any cationic counter-ion) is neither used as a raw material, nor an intermediate, nor is it added during the synthesis of fluorotelomer based surfactants, which are widely used in the firefighting foam industry. Most foam manufacturers use telomers – apart from 3M, their former local mixing plants around the world and a few other smaller foam producers

FP70 Plus ideal for MTBE and unleaded gasoline hazards, now also with excellent Lastfire results

and suppliers who used the 3M fluorosurfactants in their fire fighting foam products prior to Dec 2002.

ENVIRONMENTAL FATE STUDIES

A literature summary of relevant recent environmental fate studies of fire fighting foam agents was commissioned by the Fire Fighting Foam Coalition, a USA based fire industry consortium, to provide evidence on telomers to the EPA investigation. This study revealed that fire fighting foam products, where the ECF-based fluorochemicals and the foams containing them were used, are persistent and mobile in the environment, leaving detectable levels of PFOS and/or PFOA at the fire scenes. On the other hand, foams that use telomer fluorosurfactants were shown to be primarily six carbon, or C_6-based products which are virtually free of C_8-based components. The study also indicated that these surfactants likely degraded to telomer sulfonates of the structure $C_6F_{13}CH_2CH_2SO_3X$ and not to either $C_8F_{17}SO_3X$ (PFOS) or $C_7F_{15}CO_2X$ (PFOA).

DuPont has also been doing extensive environmental fate studies which are indicating that telomer based fluorosurfactants are not toxic and are not bioaccumulative. This is a big reassurance to the environmental regulatory bodies and telomer based foam users that C_6 telomer based fire fighting foams are safe alternatives to replace PFOS containing products.

This confirms that telomer-based fluorinated surfactants like those supplied by DuPont for the fire fighting industry are safe for their intended uses, and help provide equivalent or in some cases superior fire performance over PFOS containing products. This results in fast and effective extinguishing of class B fires, often with less fluorine content but still tolerant to forceful mixing with hydrocarbon fuels and good resistance against re-ignition.

DEFRA PFOS RISK REDUCTION STRATEGY

The UK's Department of Environment, Food and Rural Affairs (DEFRA) has been conducting a risk reduction strategy for PFOS to understand how best to limit the environmental impact of these foams in the UK. This study could reasonably report that the PFOS

Large capacity aspirated foam Monitors like Colossus are ideally suited for efficient use of foams like FP70 Plus onto large tank fires

containing products should not be used in future, as this would increase the potential damage to the environment, so safe disposal by high temperature incineration would be a logical outcome. Replacement with alternative products, like telomer based fluorinated fire fighting foams could reasonably follow. We are already starting to see some modern Fluorine-Free Foams (F3) like the new Training Foams that mimic the front line fluorine containing products to allow users to continue training when fluorinated products are not allowed to be discharged except in an emergency. This DEFRA study also follows the provision of the European Union(EU) Existing Subtances Regulations in which the UK is taking the lead role, with several other EU states contributing. Therefore the findings and recommendations of this important Report may later also develop into EU-wide legislation.

THE WAY FORWARD

The way forward is to carry out a foam policy review within your own organisation to try and determine whether the foam currently being used fulfills all of your requirements, whether it is fit for purpose in all the applications for which it is currently being used, and assess whether other products could do this better or not. You may be using a product with capabilities you just do not need, so it may not be the most cost-effective choice for your particular circumstances.

RISK ASSESSMENT

In addition make a detailed risk assessment of your own individual operational factors to define the foam and services you need, both now and into the future as your organisation develops and grows. Look at the hazards you face; the balance of hydrocarbons to polar solvents (if any) on site; whether this may soon change; the volumes of flammable liquids stored and used in processes; the worst fire scenario you could face and what you might need to control and extinguish such a blaze – with the equipment, vehicle systems and fixed foam induction and delivery systems you have already installed; the speed of response of any municpal fire services to help; and any mutual aid facilities you can call on. These are just examples, there will be many more.

SUPPLIER AUDIT

Then assess your current supplier and look at future potential suppliers to see whether they have continuity of supply? There is a current world squeeze on fire fighting fluorochemical capacity as demand is greater than supply as ownership changes and new production

MEX Bund Pourers provide exceptionally stable yet fluid foam blanket for bund protection with natural protein based foams like FP70 Plus, Alcoseal and Niagara

plants are geared up to fulfill the shortfall created in the market by 3M's withdrawal.

Then you need to ask lots of questions? Can they provide you with adequate technical support? Do they even make the product themselves or just buy it in from another manufacturer? Can they help you identify how best to protect difficult or new hazards? Do they have a test site facility where they can show you the foam performing on realistic fires?

APPROVALS CHECK

Can they provide a range of products with internationally recognised independent approvals that are relevant for your particular application? For instance, a product approved for bulk storage tank applications is not necessarily relevant or suitable to an aviation application. Find an approval that is relevant. If in doubt, then the world renowned and respected UL 162 standard and approval from Underwriters Laboratories Inc. (UL) in USA is a sound base level benchmark of performance. Ideally add another more specific approval relevant to your application, like LASTFIRE (tank protection) or ICAO (International Civil Aviation Organisation). Unlike virtually any other foam testing standard, under UL 162 any foam product does not just have to pass the tough fire test in both fresh and seawater. It also has to be stored in drums that will not split, with certain safety information on the label and work with proprietary foam making equipment at a range of temperatures to produce foam quality similar to that which extinguished the fire test. UL listed products are also policed regularly by the strict UL follow-up service, where samples are taken without prior notice from manufacturers and/or users and analysed to verify that the formulation is consistent with the foam product that passed the test originally, so that batch to batch performance quality is maintained for the benefit of the foam user. All this of course is paid for by the manufacturers themselves as part of their service and quality commitment to you, so paying a little more per litre for such a UL listed foam can gain you reassurance, lots more value, plus peace of mind.

Is Factory Mutual (FM) the same as UL? Well no it is not. UL is a not-for-profit organisation looking after the safety of product users not just in fire fighting products. Yes FM do carry out testing, but have no follow-up service. It is a commercially driven organisation and are is also a big insurer, so its interest must be to steer anyone insured by them to use foam and equipment they have already tested to minimise their own exposure if the worst should happen and a major fire incident occurs. All very worthwhile, but not quite as altruistic and firmly on the side of the foam user as the UL testing standards have set out to be!

OPTIMISED PRODUCTS

Does your proposed or current supplier have a detailed understanding of how the various foams work through the different foam making equipment options? No better way to optimise performance of both foam and equipment than when you are in control of manufacturing both products. So it can be beneficial to buy from a manufacturer who makes both foam concentrates and foam making equipment, as a greater depth of knowledge is built up over time in both areas.

ENVIRONMENTAL DATA

Look for Material Safety Data Sheets (MSDS) for each product. A legal requirement in many countries, it gives you basic safety data for the product, basic chemical groupings contained within the product and an insight into its environmental performance. Look for the aquatic toxicity and biodegradeability data to confirm it is gentle on the aquatic enviornment, will not disrupt water treatment plants and kill fish if accidentally discharged into local rivers during an emergency. As you would expect there are some very large differences between foam types, but also surprising differences between specific products within the same foam type, so you need to look around and ask more questions. Why isn't any aquatic toxicity data stated? Often it masks poor performance, or just not tested. Either way it demonstrates a lack of commitment by the manufacturer/supplier to provide a basic level of encironmental information to you on the products they want you to buy! But without it, how do you know it is not highly toxic in the environment, or potentially hazardous to your fire fighters?

LOOK FOR INNOVATION

Is your current or proposed supplier capable or recognised for developing new and innovative products to help you meet your current needs and future requirements which could include tightening demands from regulatory bodies into the future? Have they even thought about it yet? What is their track record on innovation – are they leaders, with a broad portfolio of products with several alternatives to meet

Syndura the modern F3 Fluorine-Free Foam in action for aviation applications

your needs? Do they have both protein based and synthetic based products on offer, or do they just understand the simpler, quicker and easier to make synthetic based products, so are able to give you only half the complex story about fire fighting foams, their relative strengths and weaknesses so they can help you select the right one for your particularly circumstances? Maybe they just follow others with "me-too" products without any significant benefits, but always keep your focus on low prices – about the only way they can entice you to buy, otherwise you would have overlooked them already!

In part 2 Mike will be looking at the following areas, Telomer based, Fluorine free, modern product scores, hydrocarbon tank protection plus much much more. . . .

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Halon Alternative Suppression

By David Hoffman of the FSSA

Pic courtesy of Ginge-Kerr Danmark A/S

IT USED TO BE SO EASY. The hazard was a computer room, a telecommunications facility, or a control room. Each normally occupied, and each with a need for a specialized fire suppression system. The suppression agent had to be clean, non conductive and, most important: safe for occupants. For a while the answer *was* easy: a Halon 1301 System. Halon was safe, clean and very effective at extinguishing a fire, especially the fires most likely to be encountered in what has become known as a "Special Hazard." By special hazard, I'm referring to a room, an enclosure or a process where the revenue generated is of considerably greater value than the equipment itself. Also, with this type of system, detection and activation are accomplished by smoke detection. This method is much faster at detecting a fire than heat detection used by sprinkler heads.

While "Fire Sprinklers Save Lives," their primary purpose is structure protection vs. asset protection. Sure, you can replace just about any piece of fire or water damaged equipment, but with the developments in technology, and the importance of 24x7 reliability, clean and safe fire protection has become paramount. A fire, no matter how small, had to be detected and suppressed almost as quickly as it started. Replacing damaged equipment, or in the worst case, rebuilding entirely, due to the effects of a fire was simply unacceptable. We had advanced to the expectation of replacing a single damaged component within a piece of equipment. A component that, left undetected to overheat or smolder, would have resulted in the type of fire that could be catastrophic. And, we had advanced to the expectation that a fire could be detected and suppressed so rapidly that down time was virtually eliminated.

Yes, it used to be so easy. For all the benefits of Halon, it had its drawbacks from an environmental standpoint. In most developed countries, production was halted at the end of 1993 due to the Halons' severe Ozone Depletion Potential. Although a total ban on the use of Halons has not yet been required, the damage was done and the fire protection industry was forced to develop a new approach.

From that point forward, the choice for specialized fire suppression systems was no longer quite so easy. Although the first edition of NFPA 2001 listed eleven different agents, only two achieved initial widespread acceptance.

For all the benefits of Halon, it had its drawbacks from an environmental standpoint. In most developed countries, production was halted at the end of 1993 due to the Halons' severe Ozone Depletion Potential.

Halon Alternative Suppression

NFPA identified those as HFC227ea and IG541. To the world of fire protection, they were better known as FM-200 and Inergen. Even at that point, selection of the proper agent was not all that difficult, although it was quite competitive. The agents were so different from one another, that they each had their place in the rapidly developing High Tech and Telecommunications markets. FM-200 is a chemical agent, and to the consumer, it more closely resembled Halon 1301 when installed. Inergen, on the other hand, was a compressed gas and used a much larger quantity of cylinders that looked nothing like the Halon cylinders the customers were accustomed to. Inergen however, was made up of naturally occurring gasses and gained in popularity due to its more environmentally friendly nature. Throughout much of the 1990's through to 2001, there was more than enough need for the new "Clean Agent Systems" to keep both manufacturers struggling at times to keep up with demand.

Today, things have once again changed dramatically. There are now SEVEN commercially available agents battling for a share of the market that has been decreasing in size for the last 3 years. That's physical size as well as economic size. In the Telecommunications Industry, as well as in Computers and most "High Tech" segments, the initiative has been to develop equipment that is smaller and cheaper. A large corporation's computer system that once occupied thousands of square feet of a computer room, complete with sub-floor, now fits in a space not much more than that of a large closet. Telephone switches that once carried hundreds of calls now carry hundreds of thousands in the same space. Bulky magnetic tapes and the associated drives are all but gone, replaced by digital media storage in a fraction of the space.

These advancements that condense services and data into smaller and smaller spaces need advanced fire suppression systems more than ever before. As a simple example, imagine a small fire of a size that would consume an old 5¼ inch floppy disk. That same size fire today would destroy a CD that holds more than 500 times the data of the floppy disk. Now imagine that a fire of this size goes undetected inside a piece of equipment until it has grown to the point where it activates the fire sprinkler system. With every passing

second, the damage to the business grows, and that's damage in addition to that caused by the fire. Down time, lost production, lost revenue, and in about 30% of the cases, lost businesses are the result.

Is our industry really only about fire protection or is it also about protecting our customer's ability to continue their business, uninterrupted after a fire event? See the FSSA website at www.fssa.net, for a list of successful extinguishments that truly saved lives, property, and businesses from the potential for much greater damage.

At this point, the value of a specialized fire suppression system should be obvious in certain applications. Now, which one is right for your application? The following is a list of the available agents with a brief description of each as provided by the manufacturers.

Pic courtesy of Ginge-Kerr Danmark A/S

FM-200, FE-227, (HFC227EA)

This chemical suppression agent is manufactured by Great Lakes Chemical Corp. as FM-200, and also by DuPont as FE-227. The agents are identical to one another. As mentioned above, a system using this agent closely resembles a Halon 1301 system, but it has an Ozone Depletion Potential of ZERO. Although it requires about two thirds more agent compared to Halon to protect the same space, it is still quite efficient. This agent is safe for use in occupied spaces, it leaves no residue, and is non conductive. It is stored as a liquid and vaporizes upon discharge. Recharge agent is readily available and a discharged system can normally be returned to service within 24 hours or less.

This agent is commercially available from most major system manufacturers including Kidde, Fenwal, Pyrotronics, Firetrace, Chemetron, PyroChem, Pemall, and Fike.

INERGEN (IG541)

Inergen is a blend of inert gasses, primarily Nitrogen and Argon with a small amount of Carbon Dioxide. It extinguishes by displacing Oxygen to a level that will not support combustion, but will still support life. It does this by the addition of Carbon Dioxide to enhance the human metabolism which allows the body to make better use of a reduced Oxygen supply. There are no environmental concerns associated with this agent since it consists of naturally occurring

Halon Alternative Suppression

gasses. It is stored as a compressed gas and therefore requires a larger quantity of cylinders than the agents stored in liquid form.

This agent is available in systems manufactured by Ansul.

ARGONITE (IG01)

Argonite is similar to Inergen, but without the addition of Carbon Dioxide. It is available in systems manufactured by Chemetron and Ginge-Kerr in Europe.

FE-13 (HFC-23)

FE-13 is a DuPont product that has all the required characteristics of a "Clean Agent". It is safe, non conductive, leaves no residue and is well suited for certain specialized applications. Commercially, it is primarily used in low temperature applications. It can also be used for inerting, allowing for high concentrations due to its large margin of safety. FE-13 is available in systems from Kidde.

FE-25 (HFC125)

FE-25, pentaflouroethane, is also manufactured by DuPont. It is electrically nonconductive, noncorrosive, free of residue, has zero Ozone Depletion Potential, and is an environmentally preferred alternative to Halon. As a clean agent, FE-25 mixes thoroughly in air and does not leave behind any residue, which would cause damage or pose a post fire clean up problem. This means no collateral damage and minimal business interruption. DuPont FE-25 is intended to protect people, high value assets and the continuity of business. FE-25 closely matches Halon in terms of physical properties such as flow characteristics and vapor pressure. The pressure traces and spray patterns for FE-25 nearly duplicate that of Halon 1301. This makes FE-25 a cost effective choice when retrofitting an existing Halon 1301 system. FE-25 systems are available from the Fike Corporation.

NOVEC 1230

3M™ Novec™ 1230 Fire Protection Fluid is a new kind of clean agent halon replacement designed for streaming, flooding, inerting and explosion suppression applications. The product is based on a proprietary 3M technology (C_6-fluoroketone) that offers zero ozone depletion potential, an atmospheric lifetime of five days and a global warming potential (GWP) of 1. Novec 1230 fluid is listed as "Acceptable" by the U.S. Environmental Protection Agency (EPA), and has been approved for commercial sale by most major regulatory bodies around the world.

The NOAEL ("No Observable Adverse Effects Limit") for Novec 1230 fluid is 10% concentration. Because it typically is used at volumetric concentration levels between 4 and 6%, the product offers a safety margin between 67% and 150% – the widest margin of safety of any commercially viable clean agent halon replacement – making the product ideal for use in occupied spaces.

Novec 1230 fluid is stored as a liquid but becomes a gas upon discharge, allowing for easier handling, storage and more efficient use of space. As a low vapor pressure liquid, the product can be shipped safely by air in bulk quantities in compliance with regulations, without additional restrictions. And because it is a non-pressurized liquid, refilling after discharge is simplified. Like other clean agents, Novec 1230 fluid is non-corrosive, non-conductive and leaves no residue, so it will not harm delicate electronics, data storage media, machinery and other equipment.

Specific systems designed for use with Novec 1230 fluid have received approvals and listings by various certifying organizations around the world, including Underwriters Laboratories (UL), the International Maritime Organization (IMO) and Factory Mutual (FM). Additional information on Novec 1230 fluid is available on the web at: 3m.com/novec1230fluid.

EDITOR'S NOTE

It should also be noted that two further options are also available, namely **Halotron™ 1** which is manufactured by **American Pacific Corporation** and has systems available through Kidde, Buckeye & Badger (more details at www.halontron-inc.com). The second product mainly found in Europe is NAF S125 manufactured by **Safety Hi-Tech.** Very many NAF S125 systems have been sold by **LPG.**

As you can see, there are numerous options available and there really is no wrong choice. The most important decision one can make is to protect your assets and your ability to continue to conduct your business, virtually uninterrupted in the event of a fire. With today's clean agent fire suppression agents and systems, your advanced technology and sophisticated equipment can be safely protected by ours.

As a clean agent, FE-25 mixes thoroughly in air and does not leave behind any residue, which would cause damage or pose a post fire clean up problem.

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Action?

By David Lane, MIFireE, Fire Consultant, Producer, UK

Derbyshire FB Firefighters recovering "Casualty" through Cross passage 23 during the Exercise filming.
Pic courtesy of Lane Jefferies Fire Consultants

ACTION! 'First Responders' acting in the event of an emergency can only function as a direct result of their training and 'Personal Development'. So how do we communicate the full complexity of designed response measures and other important issues to staff and emergency first responders alike? Can complex training matters be addressed by using filmic visual educational/ training/developmental resources?

SCENE SETTING

The Woodhead tunnel project – a power transmission tunnel complex, twin bores linked by a number of cross passages carrying high-energy electricity cables, forming a cross-country link under the Pennines to cities, such as Sheffield, Manchester and Liverpool.

The risks included oil insulated cables with two underground oiling stations maintaining the vital insulating pressure within the 5 km length twin bores. Ongoing maintenance and repair means engineers and contractors working in the tunnel and a history of destructive fires. The recommended measures in year 2000 include automatically responding water fogging suppression systems located at key risk areas, a heat detecting fibre optic cable covering the whole complex, and linked to a computerised warning system. Emergency and primary lighting was installed, also informative and instructional signage, together with a leaky feeder radio communications system throughout the complex. Command and control communications are linked via an onsite Incident Command Room. Detailed plans were developed to enable rapid response actions by staff. All plans were agreed, tested, and upgraded, accordingly. The first time technology of this sophistication was installed in any UK tunnel, requiring complex new equipment and procedures to be introduced to workers and different First Responder agencies – Police, Fire, Ambulance and Emergency Planners across different regions with their different dialects and cultural boundaries.

The design of fire safety precautions broke new ground and gave the requirements for operational knowledge and commensurate training commitments. Also the information, in order to have the desired safe integrated cross agency response, was needed by all agencies and employees concerned. The depth of the training problem soon became apparent. Those likely to be "at risk" included, management staff, consultants, maintenance staff, contractors, engineers, visitors, First Responders and other rescue workers; the audience – numerically, thousands. Three different fire brigades are involved, primarily South Yorkshire then Derbyshire backed up by Greater Manchester – needing precise geographical information.

The need for a training film transpired during Project Management discussions. An effective training film is much more easily said than done. I knew from experience that those asked to operate in hostile and life-threatening environments would be highly reluctant to suspend belief in their tried and tested methods of fire suppression. The problem was to win over their hearts and minds with consistent quality information which engaged them to facilitate retention of this potentially life saving information. All agencies became involved to ensure their needs were integrated and interdisciplinary requirements fully met. In the final analysis a training programme titled "**Tunnel*vision***" was produced and distributed to all the Worker and First Responder audiences.

WHY MAKE A FILM?

Before we answer this, you have to know how and why this audience would respond to film in the first place. It's too easy to suggest that the television culture means we're sensitised to moving images and therefore, Video/DVD/Film is quite acceptable as a learning medium. The questions are, what are the issues, what do we know about the reactions of audiences, and what will cause them to take notice and learn?

The fundamental question remains. How useful is this to the learning process, and how much relative information is it possible for the student to absorb? It's important to note here that learning to understand images doesn't require the lengthy period of induction

Firefighters acting out a rescue for real time demonstration on location and viewing in the Production. *Pic courtesy of Lane Jefferies Fire Consultants*

characteristic of language learning, and the permeability of cultural boundaries is much greater for images than for language. The case for presenting information via a moving image system is confirmed by Soloman and Liegh – *"When students are asked to learn from video they are likely to invest more mental energy in viewing and their comprehension of the subject matter is increased".* So it becomes more profitable from a training standpoint that the learners watch with a specific objective in mind.

Good reasons to make a film. Research confirms, comprehension is markedly increased when learners are instructed to view a video/DVD/film with an educational objective in mind. So as long as the lesson objectives are clearly stated this will assist comprehension, which in turn has an important effect on keeping attention and the retention of information. We stated the **Tunnel*vision*** film's objectives at the outset – "A programme about Fire Risk Assessments and Fire Protection Systems". We needed to be "on message" to large numbers and transcending cultural boundaries – film could do this.

After 100 years the cinematic image has become so familiar, so ingrained into our psyche, that we now accept that the manipulation of reality is the norm. But following the latest trends in broadcast TV or the Movies won't help your audience to learn anything. But don't exclude the entertainment factor. An audience will be drawn to a film that can entertain by being interesting, or containing tension signifiers i.e. surprise, shock, or by provocation. The selection of the material and the information, the use of sound, music, colour, the tone of the script and narration, how the information is organised will all have some play regarding a student's achievement level. A teaching/training medium has a different set of values and different objectives, but it still has to be – entertaining.

Physically viewing a TV screen is very different from a cinema screen; in effect it means there is less physical involvement with the image, an important point in the design of the production. For 'Woodhead Tunnel' we chose the device of asking the viewer to watch real Firefighters going about the work of a basic daily function – that of carrying out an operational information gathering inspection at the premises. A task all would be interested in, moreover especially a location that they may have to attend themselves – moreover at which a real threat to their personal safety may exist.

FILM

A motion picture is very different in design parameters than a training film. When watching a movie people need to move their heads to encompass the wider screen. The good director manipulates audience reaction and point of view by combinations of composition, colour, set design, style, acting, action, cutaways, drama and sophisticated surround sound.

A teaching medium has a different set of values and very different objectives. Physically viewing a TV screen is very different from that of a cinema screen. You see all that's happening within a TV without turning your head or adjusting eye focus. There's no long shot or action on the horizon in a TV thriller. Having to take account of the lesser movement of the individual in watching a small screen means, TV is designed around the Establishing shot. Mid Shot and Close up.

In **Tunnel*vision*** we use action from the beginning e.g. by using a helicopter flying over the terrain to both focus attention within the small screen – concurrently giving real time vital geographical and topographical information – almost impossible to show to learners other than by this medium.

We used the 'Grammar of Film Making' to 'storytell' – we needed to talk about 'The Woodhead Tunnel Project' but inside 45 minutes, a lecture time frame, Plotting and Drama facilitated this for the project brief.

Currency – the now factor – is important, and can be used to denote when something is new and interesting, the style adopted within **Tunnel*vision*** reflected the UK TV's current trends. Thereby engaging the viewer to "see" the information presented in this light, because of their memory of viewing favourite TV programmes – the fire suppression technology installed was cutting edge and needed to be portrayed as such for many reasons.

COMMUNICATIONS

That's what it's really all about, understanding how visual communication works. We know that film and television are easy to decode because they call upon pre-existing visual and cognitive skills. To be successful a programme must be designed in order to help your audience 'suspend belief'. For the Woodhead Tunnel it permitted the representation of an environment through film to be vicariously and safely perceived without risk time and again. Vital given that normal viewing is impossible when 400Kv energy at 1500 amps are flowing through!

TRAINING

In "Cognitive Skill and Acquisition", Neves and Anderson provide evidence that repetition affects a subject's cognitive skills. Video/DVD can sell, motivate, and suggest a preferred behaviour, demonstrate a technique, market a product, demonstrate a procedure, explain a policy, it can confirm, enlighten and

The "Threat" to your life! Tunnel fire test showing effects of fire in a confined tunnel space.
Pic courtesy of NIOSH, USA.

Interior of North Bore Woodhead Tunnel, showing cable troughs, railtrack and crosspassage entrance to South Bore, overhead emergency lighting and distance signage on wall. *Pic courtesy of Lane Jefferies Fire Consultants*

enlist. What it cannot do is become a substitute for actual hands on practical training. Thus in the Woodhead Tunnel case, full scale Exercises are carried out on site together with the respective organisations own Training Programmes.

IMPORTANCE OF RESEARCH

The most important part of making a programme is research, this is the fundamental knowledge on which the script will be based and the single most important element of any film is the script. For **Tunnel*vision*** this research period encompassed, the almost four year life of the project. This indicated that a film was the most efficient way of delivering the required information particularly given the many different agencies across the three large regions and their disparate geographical locations for stations (some 200 stations) that the training had to be delivered at for the employees, contractors and emergency responders alike.

TELL ME A STORY

As the script is the foundation of the whole project, what the good script should do is somehow condense the information indicated by research and tell the audience a story, and the best script always lays down a challenge for the viewers. Research said all Workers and First Responders needed to know what would happen in a fire in the tunnel – this was the story – that of an inspection, which metamorphosed into a real fire, thus giving the real time vital information required.

PRESENTERS

A story needs a storyteller. Sometimes the use of the personality presenter can become effective without alienating the audience i.e. someone who the audience can empathise with. So style can come to your aid. To enhance an informative presentation in an entertaining manner the subject must be wrapped around with an element of style.

CLIENTS

The client is always right! Ensure that you have a good brief it will reduce most if not all the problems between you and the client. In this specific case we had an expert highly professional client who well understood risk management.

FILM IS THE ANSWER – IN THIS CASE!

In conclusion:

1. Make a film, with the involvement and agreement of all concerned.
2. Video/DVD allows consistency and involves the viewer in moving image information delivery. Comprehension of a message can be aided by this delivery method.
3. Have clear film objectives.
4. Entertain the audience.
5. Use Video/DVD to focus on specific issues.
6. Video/DVD/film can deliver the message at different locations to large audience numbers.
7. Design your programme specifically for purpose
8. Set your film values and training objectives.
9. Understand your craft and 'the Grammar of film'.
10. Hold your audience in 'suspension of belief'.
11. Carry out research, research, and research.
12. Communicate your message, after research.
13. Repeat your message to educate.
14. Repeat your message to educate.
15. Tell a story and support 'hands on' training.
16. Use Presenters, have your own style.
17. Keep clients satisfied.
18. Make the film – to the brief.

Ultimately know what your brief is – we had one to make a training resource that:

"Provides information regarding the inherent dangers from fire within the Woodhead Tunnel Complex. To show for emergency purposes the internal and external topography of the Woodhead Tunnel Complex. To provide an aid to training on the fire safety related provisions and procedures for the tunnel at both strategic and tactical levels for emergency responders, employees and managers with training and operational responsibilities. To explain the technology and operating procedures, relating to fixed and mobile fire suppression systems."

This could only have been accomplished over such a wide geographical area and disparate locations with such consistency by the use of the video filmic medium for all the reasons stated. Empower your First Responders to act from the filming Action!!!

REFERENCES

1. David Lane. Tunnel Questions? International FP. February 2003.
2. David Lane. Tunnel Vision – a holistic approach. Fire. February 2002.
3. Marx & Frost. "Management live – The Video/DVD Book". University of Massachusetts.
4. R E Clark. "Reconsidering research of learning from media". University of Columbia Vancouver.
5. R B Kosa. "Learning with Media. Will media influence learning by re-framing the debate"
6. Steven Meisel. Various titles. University of Philadelphia.
7. Messaris. "Visual Literacy Image, Mind and Reality".
8. Soloman and Liegh. Various titles. Various publishers.
9. Neves and Anderson. "Cognitive Skill and Acquisition". 1981.
10. P Pirolli and J Anderson. "Role and Practice in Fact Retrieval". Carnegie & Melton University.

FACT FILE

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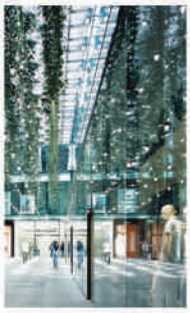

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SAINT-GOBAIN GLASS PROTECT

Building Fire Prote

By Mike Wood of Pilkington

Fire-resistant partition with Pilkington Pyrostop™ in an international institute

THE LATEST YEARLY SUMMARY of large-loss fires (that is losses of $5 million or more) which appeared in the last November/December edition of the NFPA Journal gave me cause to reflect on the universal nature and risk of fire, on common issues concerning fire protection that face everybody in the fire safety community independent of political boundaries.

Direct property losses reported by NFPA for the 2002 data were $699 million, from 46 large-loss fires. Civilian deaths were 5, with a total of 116 injured individuals. Out of 41 examined cases of building fires, only 24 had automatic detection systems and only 12 had automatic suppression systems. Of these 12, the suppression systems operated in only 7 cases and of these only 2 were effective in controlling the fires. The reasons for ineffective function were variously reported as being due to overwhelming of the system by rapid fire spread, explosion damage, and water supply problems. In one case there wasn't sufficient information. There was no information available on the presence, or otherwise, of adequate compartmentation or whether proper passive fire protection measures were in place. This detail wasn't reported, presumably because the information just wasn't documented or accessible.

We clearly can't afford to rest on complacency, that we are doing all that we can to protect people, buildings and assets against fire. There is still a lot to be done.

Review of previous editions of the NFPA Journal shows that the broad picture does not substantially change from year to year. Each year the conclusions are more or less the same as well. For example, from the Dec 2003 report: "Human error or negligence is a major factor in today's fires, but proper design, maintenance and operation of fire protecting systems and features can keep a fire that starts through human error from becoming a large-loss fire." And, from the 2000 copy: "Adhering to the fire protection principles reflected in NFPA's codes and standards provides the best chance of reducing large-loss fires. These include proper construction, storage, and maintenance, which are clearly effective in reducing the risk of fire and explosions by helping control or limit fire spread." What applies to large fires in terms of best practice presumably applies to smaller fires as well.

The same basic issues behind the figures are coming to the surface in the wake of the UK Government's White Paper "Our Fire & Rescue Service" which was published towards the end of 2003. This defines a major overhaul of fire service organisation and operation directly linked to Government policy on getting better value for money from public services.

WORKING AS ONE FIRE SAFETY COMMUNITY

A consequence of the UK Government's modernisation proposals is that service cover and response time may not apply alike, and as in the past, to all districts. Each fire service area will have an integrated risk management plan intended to match resources to hazard, need and fire risk: the right resources, in the right place, at the right time. Accordingly, fire service response will vary with building function, risk level, and type of occupancy in line with local plans. And there will be a greater emphasis on life safety, particularly in domestic properties, which means that commercial and public buildings are likely to end up with lower levels of emergency cover and a relatively higher risk of damage and losses in the event of fire. This could result in massive

ction for the Future

financial and economic implications for communities, businesses, insurers and building owners, including business disruption costs and potential knock on effects on jobs. Insurers will start to ask themselves about the level of exposure and whether the taking on of higher insurance risks in cases where adequate structural protection is *not* in place is a wise level of exposure. Consequences will be higher insurance costs and more difficulty in obtaining adequate insurance cover.

There are therefore major implications in the areas that are judged to be lower risk to life (which may, however, be higher economic risk). There are also major implications for the fire fighters, as they may be faced with dealing with major (large-loss) fires in situations where their resources are stretched.

Achieving targets for improved life safety, property protection and fire fighter safety then becomes an issue for the whole fire safety community as one, working together like never before. It requires that a broad definition and recognition of "fire engineering" is taken – inclusive of fire science, structural engineering, fire safety engineering, testing, design and specification, fire systems development, fire resistant materials, construction and installation. Counter to what sometimes seems to be the case at present, there needs to be better mutual recognition between these separate groups and a willingness to enter into stronger dialogue to arrive a better mutual understanding.

HOLISTIC DESIGN & COMPARTMENTATION

Different elements within a structure don't act in isolation. They are connected such that the performance of one part can dramatically influence the performance of another. On the face of it, that is a self evident truth that should not really need too close an analysis. However, it seems to be strangely forgotten all too frequently when fire protection concepts are considered.

Holistic design means that the building as a *whole* is designed with fire safety and protection in mind, not just parts of it independent of the rest of the building. Design, engineering, materials, construction, installation and building use can't be treated separately. That is, not if our objective is, amongst others, a building that is safe and protected against fire. Reliance on just one fire protection system isn't enough. Active systems don't absolutely and necessarily guarantee watertight performance, and absolute control and extinguishing of the fire in all situations. That's the message of the NFPA report. Similarly, it can't reasonable be held that passive fire protection compartmentation and fire control barriers would necessarily in every case offer an infallible solution on their own.

Fire is fundamentally unpredictable, capable of springing surprises and not necessarily compliant with standardised, structured fire models. In developing and applying a building fire protection strategy, therefore, it is a balanced and measured application of fire protection features that counts, to guard against the widest possible combination of fire risks and hazards.

JOINT ROLES FOR PASSIVE AND ACTIVE SYSTEMS

Passive and active fire protection measures need to be combined, working together as a paired team to the best of their individual strengths. Compromise or trade off between different measures in the name of saving cash may threaten bigger economic losses in the longer term – to say nothing of risk to life. Following the principle of "lowest bidder wins" may also severely compromise fire safety.

Paying attention to the fabric of the building is fundamentally important in achieving fire protection. Compartmentation is a tried and tested design principle that should not be thrown to one side. It's a question of applying basic fire protection structural systems to significantly reduce the risk of damage and danger through limiting fire spread and increasing the chances of fire control by ensuring that there are fire-resistant zones to restrict any fire to a manageable size. Active systems also work better within defined and controlled fire protection compartments.

MATERIAL SELECTION AND FIRE PROTECTION DESIGN

Under a more risk based regime, the correct selection of fire protection materials becomes even more imperative,

Atrium with fire-resistant glazing with Pilkington Pyrostop™ in an office building

as does the level, reliability and consistency of product fire performance. On the part of fire engineers there needs to be a greater awareness of how products function, what happens in a fire and what could compromise fire performance.

Fire fighters have a right to know what they might have to face in a building fire; and they have to know, and trust implicitly, that the structure will not collapse and fall about their ears as they go about their job. On the other hand, manufacturers of fire-resistant materials and systems have to be as fully aware of the fire environment as they can, and do as much as they can to understand the performance of their products under fire conditions. This to my mind extends to a responsibility for performance that goes beyond the basic passing of the specified standard survival time in a prescriptive furnace test that might not entirely replicate the full range of potential temperature/time scenarios experienced in real fires.

Building Fire Protection for the Future

Inner staircase providing safe escape in the case of fire by fire-resistant door with Pilkington Pyrostop™ in an office building

If we are to make further progress in the application of materials and in fire-resistant design then manufacturers and the fire service need to work more closely than before in the exchange of information. Also, fire engineers drawing up fire protection concepts, specifying materials and structures, need to have an implicit understanding of the basics of material behaviour in fire, and of the implications of what the knock on effects could be of design decisions. They should also know who to ask when the product under consideration requires specialist input of expertise and know how.

GLASS, TODAY'S MODERN BUILDING MATERIAL

Glass in building, and fire-resistant glass in particular, is a good example of a modern day high tech building material. Today's architecture depends substantially on modern flat glass products, because of the wide range of functional benefits, aesthetic effects, and design styles that can be provided by glass, without compromising on wider requirements for the environment and the building interior.

Standard flat glass, however, is not naturally fire resistant. Rather the opposite. Normal annealed glass will break in a fire within, typically, 5 to 8 minutes. Thermally strengthened (toughened) glass, such as that used for impact safety reasons, may fail catastrophically and unpredictably in fire. Normal laminated glass of the type used for impact safety, acoustic insulation, and for burglar and other security purposes contains an organic interlayer which can burn when exposed to temperature and oxygen. Normal laminated glass of this type would not be expected to survive much longer than a few minutes, depending on the exact temperature exposure.

So, to make glass fire resistant – which is entirely possible to high levels of insulation with integrity performance, such as three hours in a standard furnace test – requires a special dedicated technology. Testing and development has to be such as to ensure a guaranteed function in case of fire. Such technologies are available and widely used in buildings. Using an intumescent interlayer in a multi, special laminated structure gives both a high level of insulation performance and a wide range of application possibilities. Such a glass product can be used and installed exactly as normal glass. But, in all cases the fire-resistant glass must be installed correctly in a compatible fire-resistant framed system specifically designed to achieve the required fire-resistance performance. Performance in real fires is tremendously effective.

FORENSIC FIRE INVESTIGATION CASE STUDIES

It makes sense, given the complexity of modern building design, to move away from a total reliance on prescriptive rules concerning the provision of fire safety. A more risk based approach will take us towards more individualistic, tailored solutions to meet individual building needs, with more scope for creativity and flexibility in design. High performance adaptable fire-resistant materials, such as an intumescent insulation glazing, will facilitate the development of such designs.

There has to be consistency, however, in the application of fundamental principles of best pactice in fire safety design and material selection. Flexibility should not be taken as an opportunity to take liberties with the basic principles of structural fire protection, or passive fire protection separation, or building compartmentation. It isn't acceptable through design to consciously pare down the margins such that constructional materials are taken closer and closer to their performance limits.

In this approach there will be increasing challenges for materials, especially the range of fire conditions that could result from the variety of modern building designs and the range of potential fire loads possible from modern building contents. It is therefore critically important that manufacturers of fire-resistant materials obtain feedback on the conditions that arise in modern building fires. It is also critical that, if the opportunity arises, first hand forensic investigations of material performance in real fires is captured and supplied to manufacturers.

Such information and feedback is very important, but sadly very rare. In the future this will be needed more and more if the limits regarding fire protection design are to be explored in the process of developing a more risk-oriented balancing of hazard, probability, emergency response, and consequence.

So, let us have more of the reviews of the type provided by NFPA. And let us, if we can, have increased scope to encompass materials. But, that requires a change in outlook and a different approach. It's important, however, if we are to succeed in building fire protection for the future.

Mike Wood has been thirty years in the glass industry with Pilkington. He is chairman of the Glass & Glazing Federation's Fire-Resistant Glazing Group, chairman of the Passive Fire Protection Federation's strategic development group and a member of the Fire Safety Development Group as well as a participant in relevant BSI standards committees on fire.

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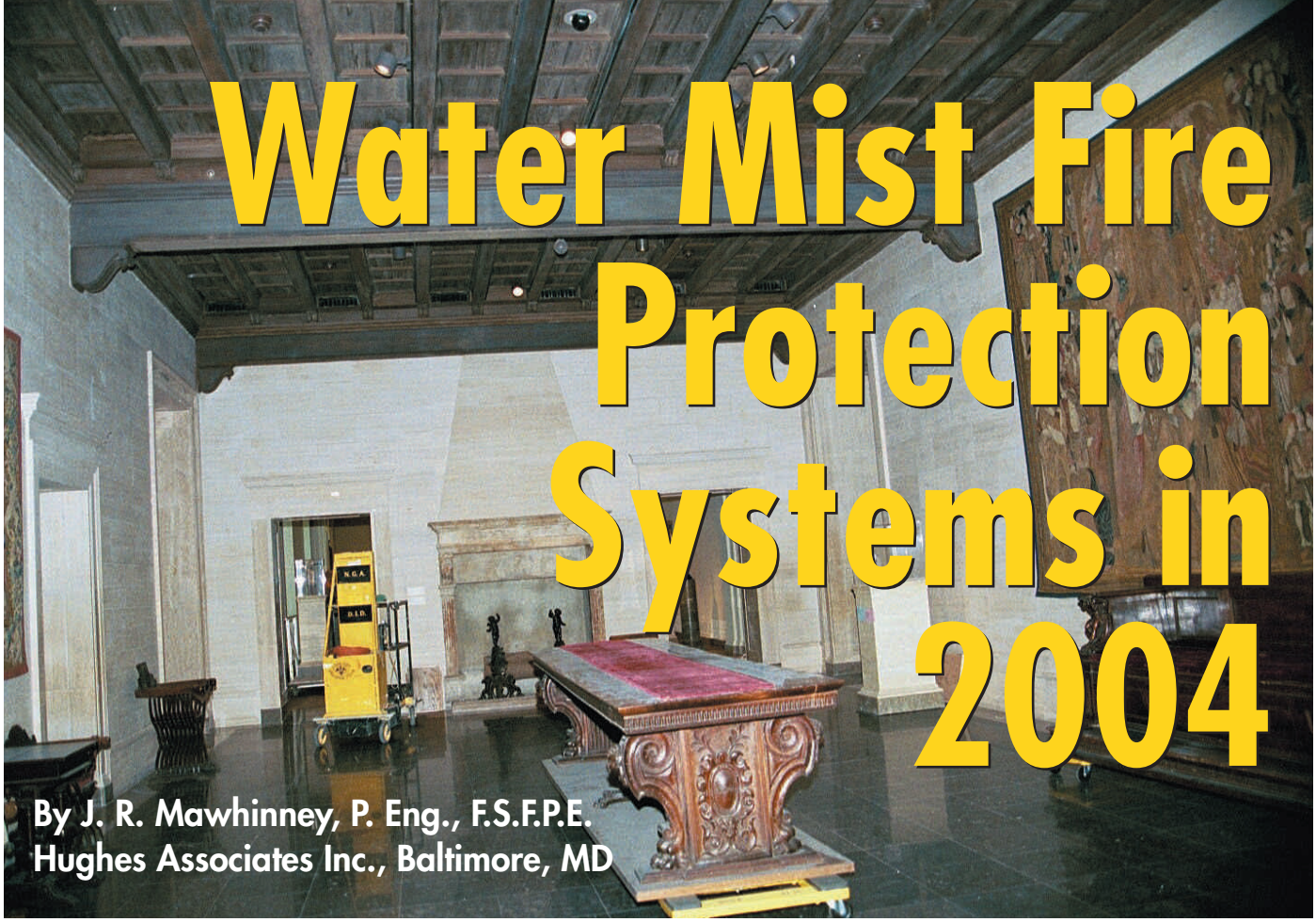


Water Mist Fire Protection Systems in 2004

By J. R. Mawhinney, P. Eng., F.S.F.P.E.
Hughes Associates Inc., Baltimore, MD

Water mist system designed for combustible ceiling, Sculpture Gallery, National Gallery of Art, Washington, D.C.

Achievements and Future Growth

THE GROWING PRESENCE of Water Mist in the international fire protection arena as a viable fire suppression agent and a promising new fire protection market is the result of more than a decade of scientific and commercial research and development. The economic incentive to improve the technology of extinguishing fires with water originated with two international regulatory events.

The Montreal Protocol in 1987 was the starting point for international cooperation to eliminate environmentally damaging fire extinguishing agents such as the Halons. In 1992 the International Maritime Organization (IMO) issued an amendment to the Safety of Life at Sea (SOLAS) fire safety regulations that prohibited the use of new Halon systems on ships. Given that clean water is not subject to environmental regulations, researchers began to study how it could be used as an alternative to the ozone-depleting gaseous extinguishing agents. At the same time IMO initiated regulations to require the installation of sprinklers on passenger ships. Given the importance of weight distribution to the stability of ships, the IMO requirements for retrofitting passenger ships with sprinkler systems created a large market for a light weight, low water-usage equivalent to a sprinkler system. This combination of new regulations simultaneously created funding for research and a visible market. It sustained the effort of manufacturers to develop new nozzles and hardware to create very fine water sprays, now referred to as *water mist*, for fire suppression systems.

The development of standards to ensure adequate performance of water mist fire protection systems evolved in parallel with the commercial development of hardware. By the year 2003 the National Fire Protection Association (NFPA) in the U.S. had published its third edition of NFPA 750, Standard for Water Mist Fire Protection Systems [1]. In Europe, the Comité Européen des Normes (CEN) Technical Committee TC191 drafted a standard similar in purpose to NFPA 750, to guide the design and approval of water mist systems and components [2]. The IMO continues to refine its test protocols for marine applications. These include Resolution A.800 for accommodation, public space and service areas; MSC Circular 913 for local application systems in machinery spaces and cargo pump rooms; and MSC Circulars 668 and 728 for total flooding systems for machinery spaces. Standards laboratories such as Factory Mutual (FM Global), Underwriters Laboratories, Inc. (ULI) in the U.S., and Verband der Schadenversichen (VdS) in Germany, have formal fire test protocols for a range of non-marine applications, and have issued approvals for hardware. Approval laboratories and regulatory authorities are unanimous that design of all water mist systems must be based on the results of properly designed fire tests. These standards and fire test protocols are the foundation of the water mist industry.

Today, in early 2004, the elements necessary for marketing water mist as a broadly applicable fire protection technology are in place. Those manufacturers that survived the long research and development period and obtained approvals for their equipment are now poised to realize significant benefits from a growing market. The interest of

Water mist nozzle discharge during Eurotunnel Heavy Goods Vehicle Carrier fire test

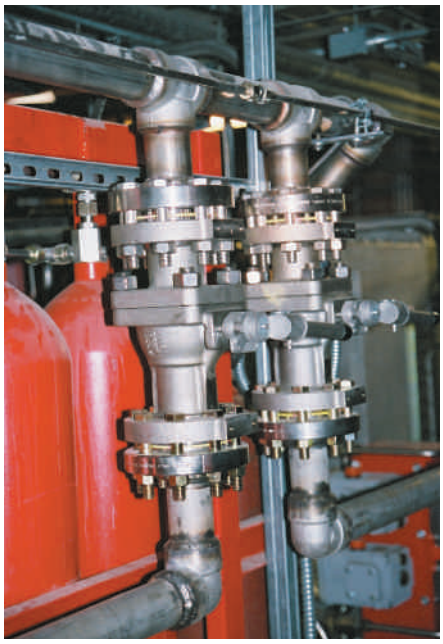
end-users, and the willingness of approval authorities to accept water mist systems, varies between North America, Europe and Asia, however. This article reports on the gains that have been made to date in establishing water mist as a viable fire protection system, and speculates on where the technology is likely to go in the decade ahead.

MARINE APPLICATIONS OF WATER MIST

Water mist systems are installed in two areas on merchant ships: a) as an alternative to Halon or carbon dioxide systems for machinery spaces, and b) as an alternative to marine sprinklers throughout the accommodation and public spaces on passenger ships. A 2003 study supported by the U.S. Environmental Protection Agency (EPA) identified that on cargo vessels, which represent 94-percent of the ships currently under construction, carbon dioxide systems are being installed in the machinery spaces rather than water mist. That choice has been driven by economics: For total flooding applications, carbon dioxide is cheaper than installing water mist (provided that one disregards the serious life-safety liability of carbon dioxide systems). The economic situation is changing, though, due to the fact that SOLAS regulations also require local application systems to protect large engines or pumps. The cost advantage of carbon dioxide for a simple total flooding application is reduced when the pumps and piping needed for a local application water mist system must be installed anyway.

Water mist is much more economically viable on passenger vessels. The reason is that unlike cargo ships, passenger ships are required by the SOLAS regulations to be equipped throughout with automatic sprinklers. Marine classification societies accept water mist systems that pass the A.800 IMO test protocols as equivalent to marine sprinklers. Once the pumping equipment is purchased, it can serve the machinery space total flooding and local application requirements, as well as the accommodation and public space systems. The cost-per-unit-area reduces quickly as the area protected increases. Although the task of installing pipe and nozzles to cover all areas of the ship are similar in sprinkler and water mist systems, water mist systems are less costly to install because they require less water and utilize smaller diameter pipe than sprinkler systems.

Water mist is the system of choice for meeting SOLAS fire protection requirements on passenger vessels. Passenger vessels reportedly represent only about 6-percent of the ships currently under construction, however. In order to access the remaining 94-percent of current ship construction in cargo vessels, the cost of water mist total flooding machinery space systems must be reduced if it is to compete with carbon dioxide.



Control valves, high pressure water mist systems, National Gallery of Art, Washington, D.C.

During the last decade, the maritime regulators established the model for using water mist as an alternative to gaseous extinguishing agents and as an equivalent to sprinkler systems. That model is also the basis for land-based applications for water mist. The next decade of development of water mist is going to be driven by opportunities in land-based application of water mist systems.

LAND-BASED APPLICATIONS OF WATER MIST

Land-based applications for water mist fall into the same general categories as the marine sector: a) as a replacement for a gaseous fire extinguishant in spaces where water was not previously used; and, b) as an equivalent to a sprinkler system. Consequently the technical basis for design of a water mist system for applications that are not encountered on ships is often based directly on one of the IMO test protocols. Factory Mutual (FM), for example, modified the original IMO test protocols to apply to land-based applications. Thus, FM has fire test protocols for " *... the protection of combustion turbines, machinery spaces and special hazard machinery spaces with volumes exceeding 260 m³",* and another for "*... Local Application Protection",* that utilize the fire scenarios in IMO MSC Circulars 668, 728 and 913. Similarly, the FM test protocol " ... *Draft Performance Requirements for Water Mist Systems for the Protection of Light Hazard Occupancies"* is based on the IMO Resolution A.800 protocol. The land-based versions of these tests may include different performance objectives than the IMO versions, in recognition of the fact that conditions on land are different than on ships at sea.

CURRENT AND FUTURE MACHINERY SPACE WATER MIST SYSTEMS

FM's modified machinery space test protocol is used to support use of water mist systems in lieu of Halon in machinery space modules in a variety of industries, notably the oil and gas production facilities in Alaska and some offshore facilities elsewhere. For example, British Petroleum Explorations (BPX) Alaska has a policy of not using Halon or inert gas

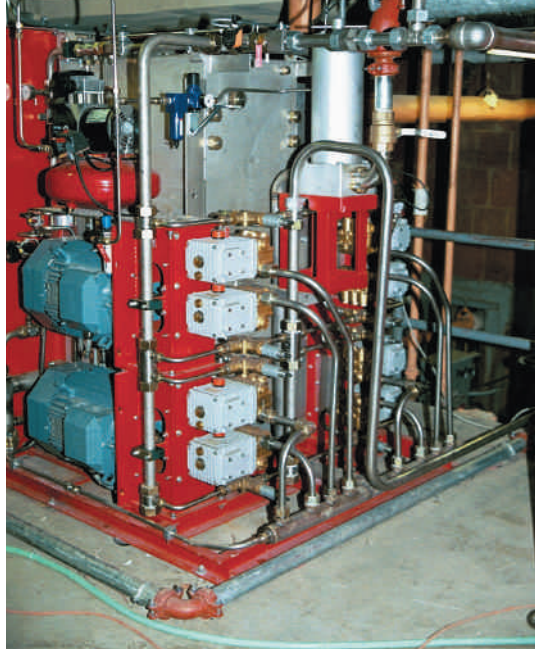
fire extinguishing systems in their new process modules on the North Slope of Alaska. Where previously they used Halon 1301, since 1998, BPX Alaska has installed water mist systems in new process modules. Other oil-field operators such as Phillips and ARCO on the North Slope, and Shell and Esso elsewhere have installed water mist systems in process modules as well. Since it is policy and not competitive pricing that dictated the choice of water mist, it has been easier (but not "easy") to sell a water mist system in Alaska than anywhere else in the U.S.

A water mist system manufacturer must have at least an approval for a self-contained water mist system for small enclosures, such as combustion turbine enclosures up to 260 m^3 in volume. Such systems are referred to as pre-engineered systems because they utilize a fixed number of nozzles on a pre-determined piping layout, and are applied in compartments with well-defined conditions. If installed within the limits of the test protocol volume they are relatively straightforward projects. There is a growing market for protecting small mechanical spaces, such as escalator machinery and other service spaces with small pre-engineered systems. The oil and gas industry has many facilities that are much larger than 260 m^3 however. The future for machinery space water mist systems therefore lies in being able to design, install and test an engineered system for larger volume compartments. For compartments larger than 500 m^3 in volume engineered water mist system design may follow the IMO lead. The IMO Fire Protection Committee is still wrestling with "problems" with the IMO test protocol for very large machinery spaces, such as 3,000 m^3 and larger. Those problems include the difficulty of extinguishing very small fires in such a large space. Would it be feasible, for example, to modify the test protocol to permit a larger "smallest fire" size for land-based applications where there are more resources to deal with the small fire than on a ship? Also, some manufacturers criticize that in order to pass the IMO test certain other manufacturers orient their nozzles to manipulate the ventilation conditions around the opening in the test room. The risk is that the resulting system may be so tuned to the test facility and test protocol that its performance under realistic field conditions is unknown. If some of the questions are resolved within IMO, it will be easier for approvals laboratories such as FM to decide how to approach the engineered system for land-based applications. The model of combining total flooding nozzles with local application nozzles around specific hazards is one solution that has already been applied in Alaska. At any rate, in order to be a player in providing water mist systems for large machinery spaces, a manufacturer needs to have more than an approval for a pre-engineered system for enclosures up to 260 m^3 in volume.

CURRENT AND FUTURE WATER MIST SYSTEMS AS EQUIVALENT TO SPRINKLER SYSTEMS

The FM test protocol for "light hazard occupancies" is the basis of design for

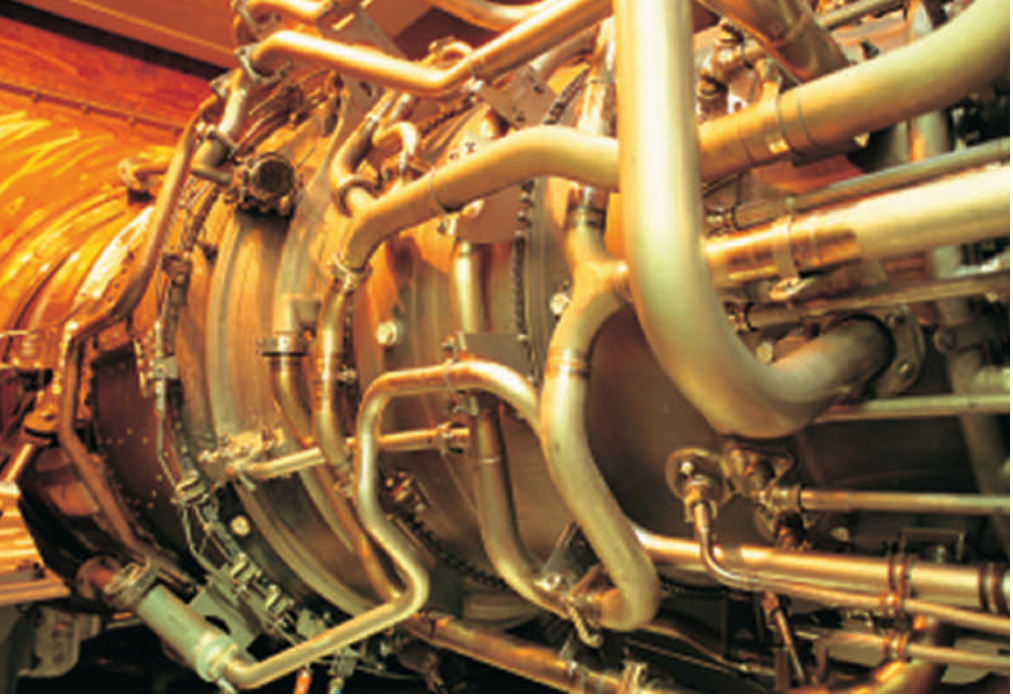
Highway tunnel water mist system, test facility, Norway, 2002



High pressure water mist pump assembly, National gallery of Art, Washington D.C.

water mist systems as a special type of sprinkler system for hotels, heritage buildings and art galleries. Water mist systems have been installed as an alternative to sprinklers in a number of heritage hotels in England, Germany, Italy and also in the National Gallery of Art in Washington, D.C. in the U.S. A number of national heritage treasures in Norway, Sweden and Finland, such as 1000-year-old wood stave churches are protected by water mist systems. The justification for using water mist in such buildings is often that there is no alternative protection technology. The installation of an adequate water supply for standard sprinklers would damage the heritage character of the property. Other attractive features of water mist are the fact that the system discharges less water than standard sprinklers, reducing the scale of water damage; and the ability to use smaller diameter pipes to deliver that water means reduced impact on the architectural features of the building. For situations where the advantages of water mist justify the high cost, more and more water mist systems will be installed during the next few years as sprinkler system equivalents for light hazard applications. At the present time, the cost of installing a water mist equivalent sprinkler system throughout a building ranges from 3 times the cost of sprinklers to equal to the cost of sprinklers, depending on choice of system and nature of the building. The more water mist systems are installed, the more they will become cost-competitive with sprinklers.

The ability to use water mist for ordinary hazard areas, such as archival storage rooms, with ceiling heights greater



than 2.5-m is much needed, if water mist is to protect all areas of a building as well as standard sprinklers. To date, few if any water mist systems have obtained approval from an internationally recognized test laboratory for much beyond the light hazard application, or ordinary hazard with low ceilings. There is no reason why water mist sprinkler systems should not transition over the next decade from "high-end", special systems, to the norm for fixed water-based fire protection systems. A water mist sprinkler system looks like a sprinkler system, acts like a sprinkler system and can be designed to protect any hazard that sprinklers can protect. It may use smaller pipe and higher-pressure pumps, but eventually the cost difference (relative to current generation of sprinklers) of those features will diminish, and there will be no reason to choose standard sprinklers over water mist.

As noted previously in this article, there is consensus among the leading water mist manufacturers, standards writers, researchers, testing laboratories, and authorities having jurisdiction, that the design criteria for a water mist system must be based on the results of fire testing to a representative test protocol. Fire testing has shown that the variation in spray characteristics of different manufacturers leads to major differences in the performance of their systems. It is not possible yet at least to define a universal design parameter that applies to all water mist systems. Fire testing to validate the design is the sole means of ensuring a standard of performance. Potential end-users of water mist technology are cautioned to ask for fire test documentation in order to assess suitability of the system for their application. The International Water Mist Association (IWMA), at its annual meeting in Madrid, Spain in September 2003, identified that inexperienced vendors of water mist equipment who promote its use for applications for which it has not been tested are a major threat to the industry. Unless the end user or other approving authority has some experience with water mist, the lack of an adequate design basis might not be understood. A single highly publicized failure of a water mist system on a national treasure such as an archival library or important heritage building would have far-reaching negative consequences for the future of water mist.

Factory Mutual has worked with individual manufacturers to produce custom fire test protocols for a number of applications, as for example:

- *Draft Performance Requirements for Water Mist Systems for the Protection of Industrial Oil Cookers.*
- *Draft Performance Requirements of Fixed Fire Extinguishing Systems for the Protection of Wet Benches and Other Processing Equipment.*
- *Draft Fire Test Protocol for Factory Mutual Research Approval of Water Mist Systems for the Protection of Computer Room Subfloors.*

VdS in Germany has developed a test protocol for a water mist system for electrical cable tunnels, and another for highway tunnels. The VdS highway tunnel test protocol is similar to a test protocol developed by SP, the Swedish National Testing Laboratory in Borås, Sweden, for a water mist system for car ferry decks. Both the highway tunnel and car ferry deck test protocols are very challenging. They involve fires in large, closely spaced transport vehicles and burning rubber tires. Eurotunnel, an end-user with enough self-contained authority to conduct its own test program, developed a test series for a water mist system for on-board protection of heavy goods vehicle carriers. After testing both standard water spray equipment and high-pressure water mist, the Eurotunnel tests confirmed that high-pressure water mist gave the best performance. One very clear lesson gained from the car ferry deck testing, the highway tunnel testing, and the Eurotunnel heavy goods vehicle carrier testing, is that a properly designed water mist suppression system can handle the most severe fires. An early impression that water mist was a "lightweight" suppression system has been proven wrong. Water mist technology permits the manipulation of spray momentum to a degree not possible with standard sprinklers, with the benefits of greater plume penetration, reduced water usage and smaller size piping. It is very possible that, over the next ten years, we will see water mist become a full alternative to standard sprinklers, used for the protection of challenging fire hazards such as large highway tunnels.

CONCLUSIONS

Today, in early 2004, the elements are in place for marketing water mist as a broadly applicable fire protection technology for replacement of gaseous suppression agents, and as a system equivalent to standard sprinklers. Those manufacturers that survived the long research and development period and obtained approvals for their equipment are now poised to realize significant benefits from a growing market. The high cost of fire testing as the basis of design for each new application continues to be an industry problem. Some of those costs may be reduced eventually, possibly by utilizing computer modeling, but for the foreseeable future there is no alternative.

REFERENCES

1. NFPA 750, "Standard on Water Mist Fire Protection Systems", 2003 edition, National Fire Protection Association, Quincy, MA, 2003.
2. Comité Européen des Normes (CEN), Technical Committee 191, Working Group 5, "Fire Fighting Systems: Water Mist Systems Design and Installation", September, 2001.
3. Wickham, Robert T., "Water Mist Fire Extinguishing Systems for Shipboard Machinery Spaces", presented at International Water Mist Association (IWMA), Madrid Conference, September 22 to 24, 2003.

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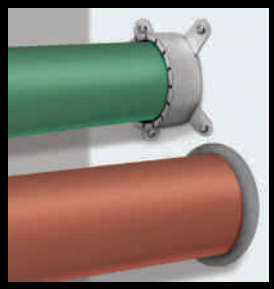

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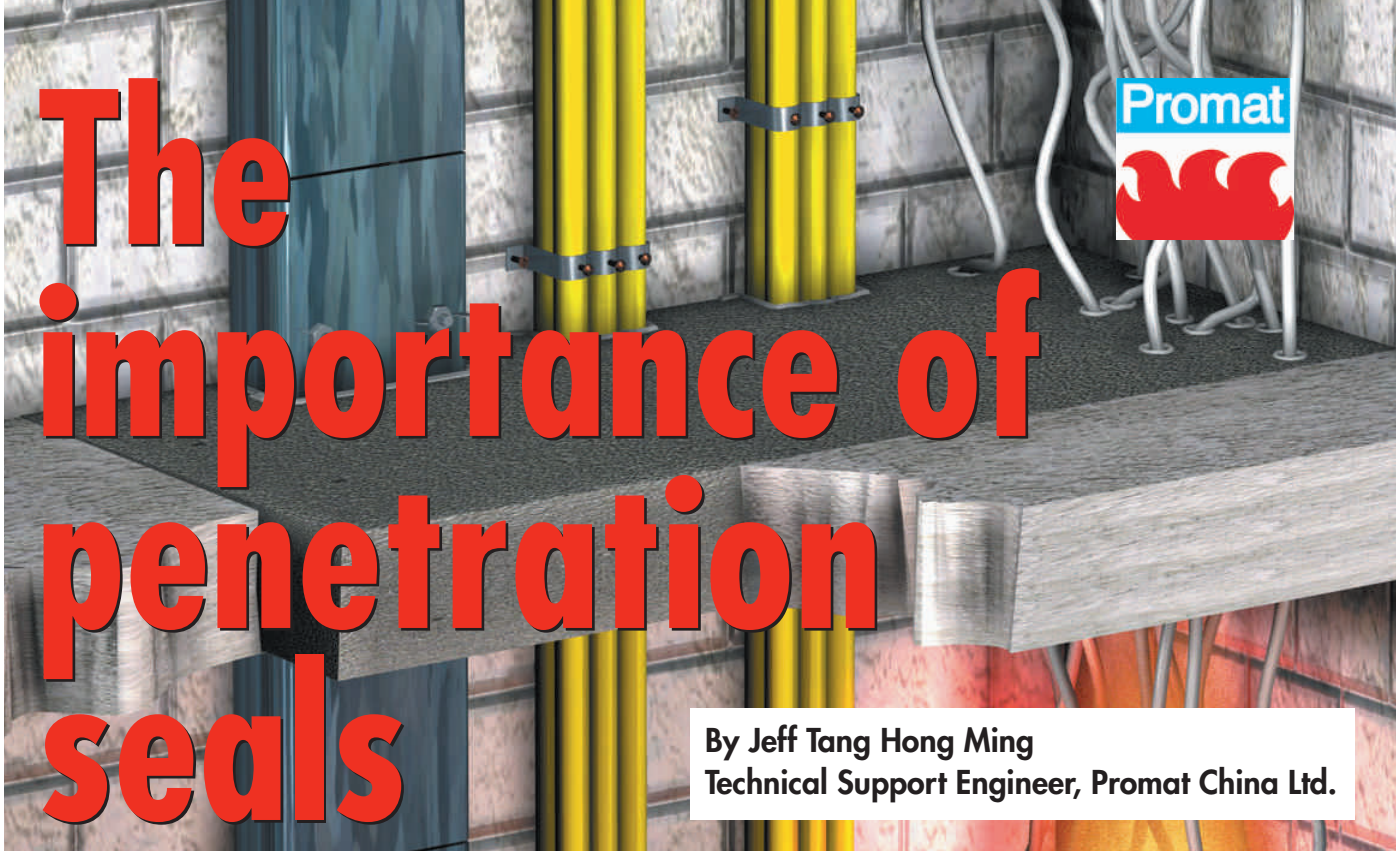


The importance of penetration seals

By Jeff Tang Hong Ming
Technical Support Engineer, Promat China Ltd.

Load bearing fire resistant mortar barrier

THE NEW EURO STANDARD EN 1366-3, entitled "Fire resistance tests for service installations-Part 3, penetration seals" defines a penetration as "an aperture through a separating element for the passage of a service". Service is defined as "a system to convey substance, for example a cable, conduit, pipe with or without any insulation, duct, chimney, or trucking; excluding air ventilation system, fire rated ventilation ducts, fire rated service ducts and shafts and smoke extraction ducts".

The new standard defines a penetration seal as "the system used to maintain the fire resistance of a separating element at the position where there is provision for services to pass through the separating element".

Why should we pay more attentions to penetration seals?

The importance of penetration seals cannot be over stated. Experience shows that penetrations tend to be the weakest link in the chain of compartmentation within buildings.

Penetration seals are mainly used in conjunction with "compartmentation". A compartment is defined as "a building or part of a building, comprising one or more rooms, spaces or storeys, constructed to prevent the spread of fire to or from another part of the same building, or an adjoining building.

We should all be aware that in such building "compartments" the most likely threat from the spread of fire will occur where services penetrate walls or floors, or where concealed cavities between separating elements interlink. Unfortunately, the lack of seals, incorrect specification and incorrect installation has contributed to many large fires in all buildings, both new and old, which would not have been so destructive if the penetrations through compartment walls and floors had been adequately sealed against the passage of fire and smoke, or that seals had been properly specified.

The main objective of compartmentation is to prevent the spread of fire within or between adjoining buildings. In this respect the inter-reaction between the elements of construction, roofs, doors, linear gap seals and service penetration seals all play an important role in achieving an acceptable solution for preventing the spread of fire and smoke throughout a building. This is especially important when considering how one particular element can affect another in a fire.

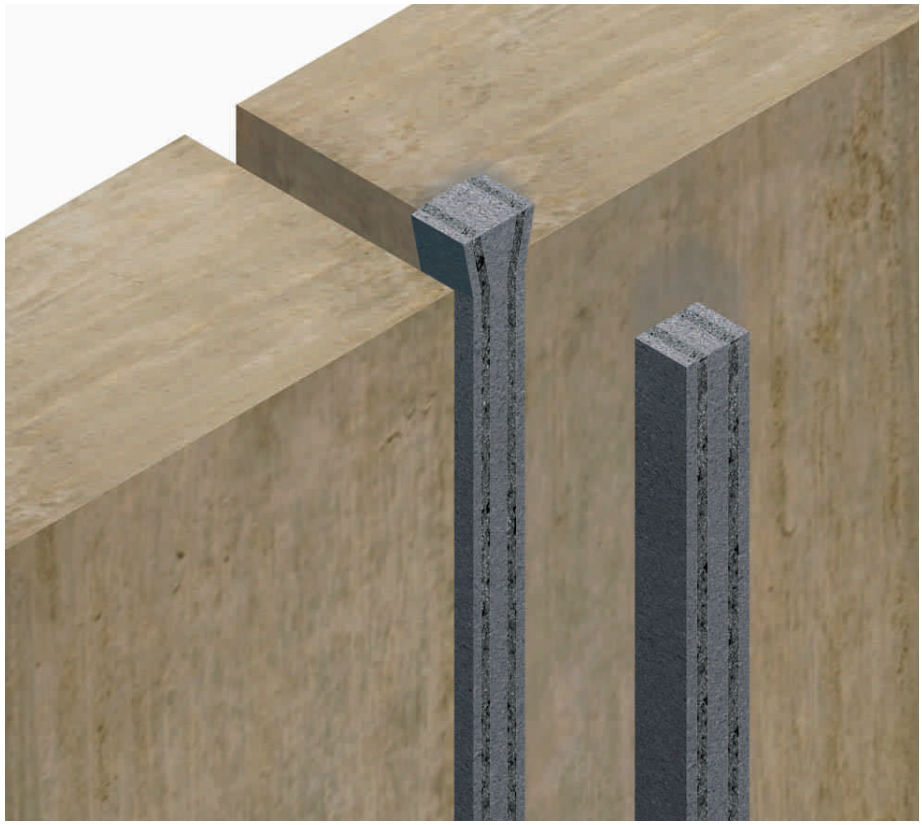
The integrity and insulation of compartment walls, floors and penetration seals through such elements, need to be carefully checked in order to ensure they will provide the fire resistance required. Integrity is fully understood, in so much as we all appreciate the element and the penetration seal must remain in place without developing fissures or holes through which flames or smoke can pass in a fire. Insulation, however, is often overlooked and there appears to be a lack of understanding of this important aspect of passive fire protection. Basically, in the case of compartment walls, floors and associated penetration seals, the temperature on the face unexposed to the fire should not rise more than 140°C above ambient, or 180°C in any one spot. This requirement is of prime importance and must not be ignored, especially in situations where combustible items are situated close to, or in contact with, a wall or floor. It should also be noted that the insulation criteria applies equally to both the penetration seal itself, AND the services which pass through the seal.

The differing types of penetrations seals

For different services that penetrate separating elements, such as cables,

The importance of penetration seals

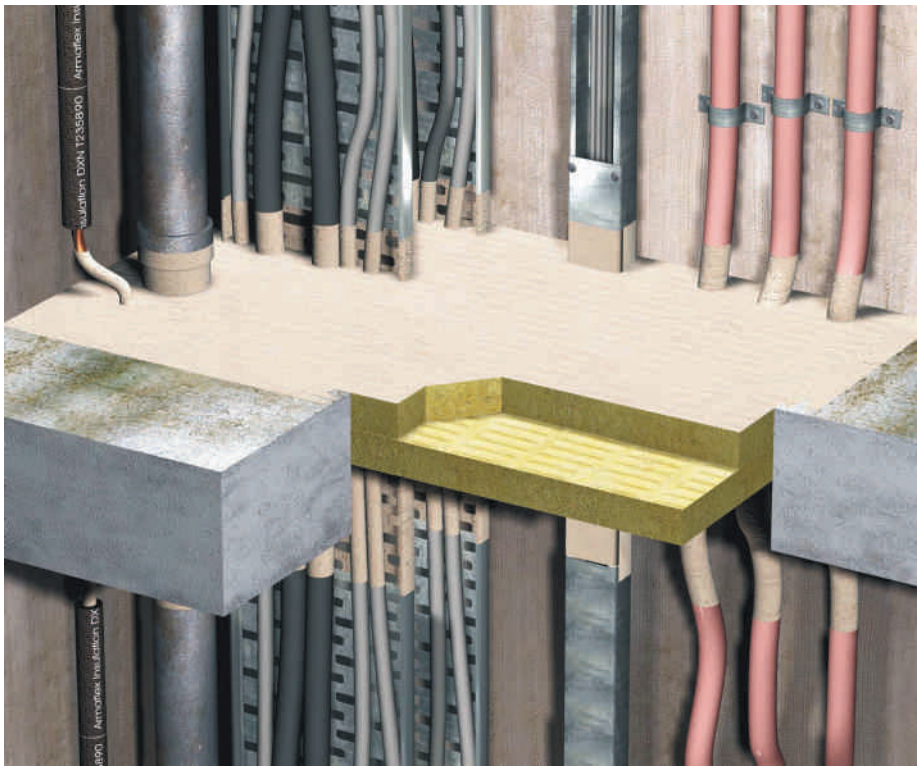
cable bundles, plastic pipes, steel pipes, pipes with/without insulations etc, different penetration sealing products and systems will be needed due to the different reaction in fire of the various penetration materials. In addition attention need be paid to those areas where the seals are required to form a load-bearing function and where the movement of the services movement due to thermal expansion/contraction etc may take place. All of these are important factors for which consideration in both the design and installation of any system requires attention.



Movement joints in walls

Combustible Penetrations

Electrical and communication cables or cable bundles, plastic pipes and some insulation products used for pipe or ductwork lagging will burn. These are all potential points of failure. Small single cables do not present much of a problem, as they tend to extinguish themselves at their junction with the penetration seal. A large number of cables (bundles) will cause difficulties and although cables should be protected each side of the seal, in order to provide an exclusion zone, care should be taken to ensure the cables do not overheat and degrade their designed electrical capacity.



Non loadbearing mineral wool coated fire barrier

Plastic pipes are less of a worry, as an intumescent collar, or wrap, can be fitted around the pipe. These collars or wraps will crush and close the pipe in the event of a fire and will prevent flames and smoke passing through it. If there is a gap between the pipe and pipe sleeve it is likely that an additional "cold smoke" seal may be required as the collar will not operate until the temperature is sufficient to activate the intumescent seal. However, different types of plastic behave very different under fire conditions, as do different wall thickness of the same plastic type. Extreme care therefore should be taken to ensure that the chosen pipe collar or wrap has been fully tested to show it is capable of providing the requisite performance under fire conditions for both the plastic type, thickness and diameter. It should be noted that it does not follow that all plastics, of all dimensions and thicknesses behave in similar manners; on the contrary, there can be marked differences in the performance between for example a 50mm and 150mm diameter of the same plastic type and thickness, similarly there can be marked differences between two 110mm diameter pipes with either a 2mm or 10mm thickness of the same plastic type.

Movement joints between walls and floors

Load-bearing Seals

Most services in high-rise buildings feed the floors via a vertical riser, which, unless contained within a fire rated shaft, requires sealing at each floor level. These are often large areas, which are accessible by doors to enable maintenance personnel to gain access to the equipment and services. This means that in many cases, the horizontal penetration seals must be capable of withstanding, at the very least, the point load of a ladder and a maintenance engineer with tools.

Different materials and systems obviously provide different physical properties and it is therefore very difficult to provide a definitive method for supporting such seals. Generally, the support is achieved by the fitting of a secured metal grid system under the penetration seal, or by fitting reinforcement within the thickness of the material. When specifying a load-bearing seal, it is always better to specify the anticipated loading required.

Penetrations and services movement

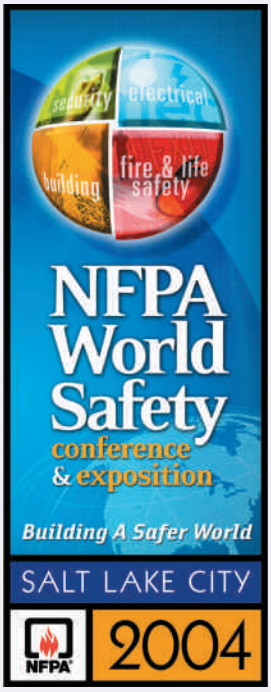
A compartment wall, if built with masonry or concrete, and has correctly constructed expansion joints, will perform well in the event of a fire. Any penetration seal should remain stable within the wall. In modern construction however, dry lining systems are frequently used. A fire rated dry lining partition is designed to take account of expansion and movement in a fire. The movement is often up to, and some time exceeds, 100mm in both vertical expansion (or horizontal in the case of ceiling membrane constructions) and severe bowing of the wall will take place. The building services penetrating the partition are invariably fixed rigidly to the underside of a concrete floor and there can be great differential movement between the partition and the services. If the penetration seal around the services is not designed and installed to cope with this movement, the seal will fail thus smoke and flame will pass though the partition. Not only will smoke and fire pass through the hole left by the failure of the seal, the inner faces of the dry lining structure will also be exposed to the fire. It will be appreciated that if such a partition is constructed with a lightweight metal framework, it will very quickly distort and fail.

Frequently, an aperture is left in a wall at its junction with a floor (ceiling) to allow services to pass through. Any ductwork, pipes, conduit, etc., which are supported by hangers fixed to the suffix of the floor will remain in place in despite of the movement of the wall. Such penetrations should therefore be sealed with flexible materials and NOT with a rigid material. Once the amount of movement has been established it is possible to design a seal that will provide many years of trouble free service. The use of high movement compounds, slip joints, and/or fire rated fabrics will be required for services such as hot water and steam pipes, etc., which can expand significantly in long runs.

It is also essential to check that the materials being used for the penetration seal have been tested in a lightweight partition. Materials tested for use in a brick or block wall are not always suitable for use as seals in a dry lining partition.

- Specification and Installation of Penetration Seals
- Establish the type, size and number(s) of the service(s) passing through the wall or floor
- Determine the construction materials used for the wall oar floor, and the size of the penetration
- Check for any possible differential movement of the structural elements within the building
- Determine the likely maximum movement of the service pipes/services
- Check if the seal has a requirement to be load-bearing
- Determine a system, which is compatible to both the element (wall/floor) and the penetration sealing system
- Establish the working environmental conditions within the building (in areas of high humidity certain materials could break down)

The above list is by no means definitive but will give an indication of some of the questions, which need to be resolved prior to commencing any installation.



NFPA World Safety Conference & Exposition 2004 – May 23-26

Since the 2002 Olympic Winter Games, Salt Lake City has been transformed into one of the most appealing cities of the American West. This beautiful city that once played host to the world, will play host to the 2004 NFPA World Safety Conference and Exposition, May 23-26, 2004. Join over 8,000 professionals from the fields of Fire and Life Safety, Electrical, Security, Building Design & Management & Fire Service at the Salt Palace Convention Center for this truly one of a kind event. There is no better venue for experiencing the latest in fire, electrical, building and life safety techniques and technologies.

The NFPA World Safety Conference & Exposition, with over 100 educational sessions and 10 pre-conference seminars, is your best opportunity to keep current with the latest codes and standards. The conference offers nine conference tracks covering; Life Safety, Codes and Standards, Detection and Suppression, necforum, Firefighting Operations/Emergency Response, Business Continuity, Leadership/Professional Development, Research and Testing, and Safety and Security. By offering such a diverse selection of topics, every attendee is able to create a customized learning experience specific to their career goals. Code experts and leading industry authorities teach all of our cutting edge sessions with the goal of helping you to acquire new skills, to help you save time and money, and most importantly, to help you protect lives and property.

A fundamental part of the NFPA World Safety Conference & Exposition™ is the Technical Committee Report Session, at which, proposed codes and standards will be brought to the membership for voting and association action in accordance with NFPA rules. NFPA codes and standards are developed through a consensus-driven procedure and will affect, in some way, every building, process, service, design and physical installation you come across. There are 31 documents scheduled to report at this year's Technical Committee Report Session, which is being held on Wednesday May 26th. The reporting documents include a wide mix of topics that range from Aircraft Rescue and Fire Fighting (NFPA 405, NFPA 408, and NFPA 422) to Venting Systems for Cooking Appliances (NFPA 96). The National Electrical Code® (NFPA 70) will also figure prominently in this session. As an NFPA member you can affect change in the industry by voting on the codes and standards you use everyday.

Attending the exposition provides you an outstanding opportunity to: evaluate products and suppliers; stay current with changes in the industry; network & develop business contacts; and to find solutions to technical problems. The exposition allows you to examine the products and services being showcased first hand. You have the ability to talk with the manufacturers face to face, have your questions answered and compare their products with those of a competitor. Don't miss this valuable three-day opportunity to meet with over 250 companies that develop the technologies and provide the services that you use on a regular basis. The exposition will feature some of the most well known names in the industry, along with many companies that are on the rise. Our exhibitors offer a unique perspective on the industry and can be a valuable resource.

New to this year's exposition is the Electrical Pavilion. This pavilion, while open to everyone, was developed specifically for our necforum participants. It is being offered to showcase products and services for design, installation and maintenance of electrical systems and equipment. The exposition is open Sunday, May 23 from 4:00 pm to 7:00 pm; Monday, May 24 from 10:30 am to 3:30 pm; and Tuesday, May 25 from 8:00 am to 11:00 am.

KEYNOTES

Bill Bradley, former U.S. Senator, professional athlete, best-selling author and inspiring orator, will be delivering the keynote address during Sunday's general session. As one of the nation's most respected politicians, Bradley offers an inside perspective on the state of American politics, foreign and domestic policy, the economy, and the ever-accelerating rate of change in technology and business. In this engrossing presentation, he will describe how change plays out in our economy, in our politics, and in our human relations.

Tony Snow, host of FOX News Channel's Weekend Live with Tony Snow, will deliver the keynote address at Tuesday's general session. Mr. Snow offers audiences rich new insights into the relationship between the press and the president, reveals the chaotic roots of governmental procedure, and chases the shadows from the dark corridors of power. He reveals Washington from the inside out, with candor, humor and insight.

SALT LAKE CITY is nestled between two spectacular alpine mountain ranges, Salt Lake combines the cosmopolitan amenities of a major metropolitan area with the inviting friendliness of an intimate, western city. Salt Lake has truly become the premiere destination of the American West. This beautiful and safe city, located amidst the grandeur of the Rocky Mountains, offers a wealth of entertainment options including golf, shopping, hiking, biking, and sightseeing. Salt Lake's nightlife is surprisingly vibrant and diverse, with an

amazing array of restaurants, brewpubs, dance clubs, and jazz clubs. With outstanding educational sessions during the day and boundless entertainment options at night, the World Safety Conference and Exposition in Salt Lake will not disappoint!

TRANSPORTATION

Salt Lake's accessibility by air is exceptional. Salt Lake City International Airport is one of the West's major hubs, served by 14 airlines offering nonstop service from over 70 destinations. Salt Lake City International Airport is just 10 minutes from downtown, and many hotels offer complimentary airport shuttle service. For travel by car, Salt Lake is at the intersection of Interstate 80 and Interstate 15. Once you arrive, getting around the city is easy. The Utah Transit Authority provides mass transit throughout the Salt Lake area and there is a Free Fare Zone in the downtown Salt Lake City area. If you enter and exit the bus within this zone you ride for free.

DINING & NIGHTLIFE

With more than 90 restaurants in the downtown area, Salt Lake offers a remarkable variety of cuisines and atmospheres. Sample regional favorites at casual family restaurants, or if you crave something exotic, you'll find a wonderful mix of ethnic cuisine, from Afghan to Vietnamese. Alcoholic beverages and superb vintage wines are offered at most restaurants. Salt Lake's night clubs provide a wide range of entertainment options, from country western line dancing, to live music including jazz, blues, and rock. You can always visit a sports bar to play pool or watch your favorite team on the big screen. There's always something going on in Salt Lake.

ATTRACTIONS & SIGHTSEEING

Outdoor enthusiasts will enjoy unparalleled access to golf, skiing, mountain biking, fishing and hiking. Utah's famed national parks and recreation areas are within a day's drive. Enjoy a sunset dinner cruise on the Great Salt Lake. Experience a multimedia star show. Travel back in time as you tour an authentic pioneer village. Dig up facts about dinosaurs, history, mining, or your very own ancestors.

ARTS & CULTURE

Salt Lake is home to the world-famous Mormon Tabernacle Choir, and boasts its own symphony, ballet, theater, opera, and modern dance companies. Salt Lake's galleries showcase compelling visual art collections, while museums preserve relics of the past, including pioneer artifacts, military aircraft, prehistoric fossils, and fine art.

SECURITY

Hosting the 2002 Olympic Winter Games gave Salt Lake a jump-start on security planning. The Salt Palace Convention Center received extraordinary training from federal security agencies prior to the Olympic Winter Games of 2002. As a result of efforts made to secure the building for the Olympics, the Salt Palace has one of the most technologically advanced security systems in the country. The Salt Palace's emergency procedures plan stresses human safety over material loss in all situations and they are committed to the safety of all their patrons and visitors.

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WEATHER

The average daily temperature in May is 60 degrees Fahrenheit, the average High is 70 while the average low is 51.

WHO SHOULD ATTEND?

Professionals concerned with saving lives and property and anyone who faces challenges in the areas of:
Fire Protection & Life Safety
Electrical
Security
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Fire Service
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TESTIMONIALS

(continued on page 38)

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Jim Crawford
Fire Marshal
Vancouver, Washington Fire Department

NFPA World Safety Conference & Exposition,

Company, Booth #	Products Description
3M, 813	3M Novec 1230 Fire Protection
5 Elem Fire Hose Company, Ltd 329	Fire hose couplings, nozzles,"Y" connectors and fire-proof paint.
ADI, 217	Low-Voltage distributor, alarm, sound, communications and structured cabling
Advanced Fire Technology, Inc 1634	Rocket technology used in suppression and post-extinguishment measures
AEI Cables, 1431	2-hour fire-resistive MI cable
AES – Intellinet 947	2-way RF alarm communication systems
AFCON 1533	Fire sprinkler pipe hangers and sway braces
Air Products and Controls, 1407	Air duct smoke detectors
Akron Brass Company, 738	Fire fighting equipment: nozzles, monitors, turrets, valves and foam equipment
Alarmsaf, Inc., 225	Power supplies up to 16 amps, ADA/NAC power boosters to 6 amps
Alert Disaster Control 722	3M foam, Emergency response & integrated risk management solutions.
Allied Tube & Conduit, 313	
Altronix Corporation, 417	Fire alarms, programmable annual and one-shot timers, custom design products
Amerex Corporation, 929	Fire extinguishers, fire systems, service equipment
American Fire Sprinkler Association 1630	
American Pacific Corp., 534	Clean fire extinguishing agents
American Pyrotechnics Assoc., 1709	Educational videos and pamphlets
AMFUEL Sales 1632	Fuel & water storage bladders
Amseco, 1122	Fire alarm signaling devices
Ansul Inc., 401	Dry chemical, foam and clean extinguishing agents
Armstrong Pumps, 529	Fire pump systems
ASCO Power Technologies, 1018	Fire pump controllers
Aurora Pump Company, 829	Pumps and packaged systems
Automation Displays Inc., 316	Alarm annunciators, smoke control panels, door monitoring systems
AxonX LLC 1531	Vison-based fire/smoke/motion detection
Badger Fire Protection 1505	
Bermad Control Valves, 635	Control valves
Big Beam Emergency Systems, Inc. 218	Emergency Lighting & Exit Signs
Blazemaster Fire Sprinkler, 1629	
Bosch Security Systems, 209	Fire, intrusion, access controls, CCTV
Bradford Industries 609	PyroBlok – industrial & architectural flame barriers
Brimar Industries 216	Safety & identification signs to comply with NFPA
BuildingReports.com 723	Mobile reporting and web-based reporting
Bull Moose Tube Company 1707	Sprinkler pipe
Chemetron Fire Systems 1511	
Chemguard Inc., 320	Foam concentrates and foam systems
Clarke Fire Protection Products, 629	Diesel engines for fire protection systems
Claval, 1125	Fire pump relief valves
Columbian TecTank, 620	Fire protection water storage tanks
Comark Corporation 323	UL864 recognized computers, displays & peripherals
Combustion Safety, Inc., 611	Engineering services, testing, inspections, training
Conrady Consultant Services, 712	Water storage tank inspection services
Containment Solutions Inc., 1422	
Cornell Communications Inc., 607	Rescue assistance, emergency call systems, pocket paging
CSD Sealing Systems 1534	Fire-stop materials.
Day-Brite Capri Omega Lighting 1530	Firedome downlight, egress equipment
DecoShield Systems, Inc., 1432	Sprinkler piping, plumbing, hydronics, cable & conduit concealment systems
Discover Trading Company 925	Valves, pipes, fittings
Digitize, Inc., 1217	Alarm monitoring equipment
Dis-Cover, Inc., 1313	Fire extinguishing products and services
Draka USA Corp., 1229	Cables
DuPont, 729	FE clean agent fire extinguishants
East Coast Lightning Equipment, 234	Lightning protection systems
Eaton/Cutler Hammer, 1223	Fire pump controllers
Edwards Manufacturing, 535	Foam and water mist pumps
Edwards Systems Technology, 801	Integrated fire and security systems
Egress Marking Systems, LLC 200	Floor proximity path marking systems
Elkhart Brass Mfg. Co., Inc., 618	Fire fighting products
Evax Systems, 1234	Voice evacuation panels
Fairbanks Morse Pump, 1029	Fire pumps
Faraday, 601	Notification appliances, fire alarms, detection products
FDL-USA, 1639	Firefly line of passive firestop materials (textile)
Fenwal Explostion Protection 1515	
Fenwal Protection Systems 1519	
Fike Corporation, 429	Fire suppression, fire detection, explosion protection
Fire Control Instruments, 1300	Fire alarm control panels
Fire Safety Displays Co., 1022	Evacuation displays, identification signs
Fire Sentry Corporation, 1433	Electro-optical fire detectors and visual smoke detection
Firecom, Inc., 935	Fire alarm systems
Fire-Lite Alarms, 1108	Fire alarm systems
FirePack Oil and Gas Industries, 1331	Pyrogen, fire caddy
Firetrace International, 1128	Fire detection and suppression for enclosures
FLAMEX Inc., 1828	Spark detection and suppression systems
FlexHead Industries, 1418	Flexible fire sprinkler connections
FM Approvals, 706	Certification services
FMG Fire Materials Group 1134	
FPE Software, Inc., 1123	Computer software
Gamewell, 1109	Safety systems and fire alarm control panels
GE Global Asset Protection Services, 1635	Loss prevention web tools
Gemini Scientific Corp. 1121	Smoke Detector Testers
General Air Products, 328	Fire protection air compressors
Gentex Corporation, 523	Signaling devices and smoke detectors for fire alarms
Great Lakes Chemical Corp., 1413	Fire extinguishing agent
GreCon, Inc., 325	Spark detection and extinguishing systems
Grice Engineering Inc, 1633	The Soffi-steel system
H.R. Kirkland Co., Inc., 1329	Fire alarm annunciators, smoke control panels, graphic maps
Halon Banking Systems, 70	Halon & Halon Recycling
Harger Lighting & Grounding, 447	Lighting protection and grounding equipment
Harrington Signal, 734	Smoke alarm products and systems
Harvel Plastics, Inc, 1335	Harvel Blazemaster CPUC Fire Sprinkler Piping Products
Heary Bros. Lightning Protection Co., Inc., 1436	Lightning protection equipment
HERC Products Inc., 1729	Chemical cleaning service
Hilti, Inc., 934	Firestop products

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Al Hogan, F.P.E.
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Ken Richardson Fire Technologies, Inc.

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Salt Palace Convention Center, May 23-25, 2004

Company, Booth #	Products Description
Home Safeguard Industries, 1522	Testing and maintenance equipment for fire alarms
Hoover Treated Wood Products, 1641	Fire-retardant-treated lumber. Pyro-guard interior & exterior.
Houston Wire & Cable Co., 321	Electrical wire and lumber
HRS Systems, Inc., 1424	Fire protection software
Hubbell Industrial Controls, Inc., 319	Fire pump controls
Hydratec, Inc., 1419	Sprinkler system design software
Hydro Flow Products, Inc., 1412	Pump testing equipment
Internal Intelligence Service 1817	
International Code Council, 1535	Codes, certification, training, and related products
International Fire System, 1701	Fire-resistant coating
International Firestops Council, 937	Association educational material
International Municipal Signal Association, 1321	Information and training
Jessup Mfg. Co., 428	Photoluminescent egress systems
Jones and Bartlett Publishers, 1438	Training and safety education
Joslyn Clarke Controls, Inc., 1034	Fire pump controls
Keltron Corporation, 519	Life safety event management systems
Kidde NAFP, 1501	Detection systems
Kidde NAFP, 1511	Detection systems
Kidde NAFP, 1521	Detection systems
King-Fisher Company, 919	Radio fire alarm, personal alerting systems
Knox Company, 1429	Key boxes, FPC caps, key source
Loos & Co., 1139	Wire rope/cable bracing system
LPCB/BRE, 1528	Approval and certification
M.E.P. CAD, Inc., 1309	Design systems software
Marioff Inc., 423	Water fire mist protection
Master Control Systems, 422	Fire pump controllers
Maxi-Signal Products Co., 229	Signals, lighting, safety equipment
McKeon Rolling Steel Door Company 1647	AutoSet fire door operator, Rolling steel fire doors
MEDC International, 1434	Fire, gas and communications systems
Merit Manufacturing, (Anvil, Intl) 221	Welding Outlets & Adjustable Drop Nipples
Metraflex, 233	Fire sprinkler system designs
Metron, Inc., 1222	Fire pump controllers
Mircom Technologies, 1711	Alarm systems, annunciators, detectors, monitoring equipment, signaling systems
National Diesel Corp., 645	Fire pump diesel engines
NFPA, 1439	Organization: codes and standards
NGC Testing Services, 1442	Testing services
NIBCO Inc., 1733	Valves, pipe hangers, supports, seismic bracing
No-Burn 1237	
Notifier, 1001	Fire alarm control panels
OCV Control Valves, 835	Control valves
Omega Point Laboratories, Inc., 741	Building materials testing
OmniCADD, Inc., 1220	
Patterson Pump Company, 617	Stationary fire pumps
Peerless Pump Company, 1717	Custom pump packages
Pem All 1416	Clean Agent Systems, Dry Chemical Systems, Panels & Detection
PM Engineer Magazine, 840	Magazine
Polaroid ID Systems 1800	Commercial Digital Identification Systems
Portman Security Systems USA 1705	Security Related Accessories and Systems
Post Glover Lifelink 437	Isolated Power Systems, Operating Room Equipment
Potter Electric Signal Co., 1017	Fire protection security
Potter Roemer, 435	Standpipe and hose equipment
Prescolite 212	Fire Shield fire-resistant recessed downlights
RBI/Consulting-Specifying Engineer, 940	Magazine
Rectorseal, 1628	Firestop
Reliable Automatic Sprinkler, 834	Fire sprinklers and valves
RemTec International, 1518	Halon recycler
Retrotec Ltd., 418	Door fan testing equipment
Robotronics, Inc., 224	Fire safety / injury protection educational products
Rockbestos-Suprenant Cable Corp., 841	2-hour fire-rated cable
Royal Quickstop, 1046	Firestop products
S4UV, 622	Lockable modular storage systems
SAFE Fire Detection Inc., 513	Air sampling fire detectors
Safety Technology International, 913	Stopperline
SDi, 623	Smoke and heat detectors testing
Security Magazine/SDM Magazine 1802	
Secutron Fire Alarm Systems, 1129	Fire alarm control panels
Sevo Systems 717	Clean Agent Cylinders Featuring Novec 1230
Siemens Building Technologies, 701	Fire detection solutions
Signalink Technologies Inc., 537	Fire-link and smoke alarm link
Silent Knight, 1200	Fire alarm control panels
Simplex Grinnell, 501	
Southwest Research Institute, 1637	Fire testing and engineering services
Space Age Electronics 822	Annunciators/Notification/Cabinets/Relay
Spears Manufacturing Company, 1323	Fire sprinklers
Specified Technologies Inc., 1723	Firestop products
Spectrex Inc., 1617	Gas and flame detectors
Spectronics Corp., 634	Fire alarm control
Subsurface Instruments, 206	Underground & Underwater Magnetic & Pipe and Cable Locators
System Sensor, 1421	Smoke detection and notification devices
Talco Industries Inc., 1235	Residential fire systems
Task Force Tips, Inc., 1728	Fire fighting equipment
Technology Research Corporation, 240	Electrical safety products, surge strips, extension cords
Terminal Velocity FM, 1721	Evacuation Signs, Evacuation Plan Software, Facilities Management
The Bilco Company 1317	
The Protectowire Company, Inc, 1425	Linear heat detection systems
The RJA Group, 1428	Fire protection training products
The Viking Corporation, 1400	Fire protection equipment
Thermal Ceramics Inc., 318	Insulation
Tiscor, 1408	Fire and safety mobile software
Tolco, 1731	Seismic bracing, hangers, supports
Tornatech, Inc., 1623	Fire pump controllers
TVA Fire & Lifesafety Inc., 1135	Engineering, consulting, loss control, project management
TVM Building Products 432	Firestop & Draft Stop Caulks
Twenty First Century Fire Equipment, 1112	Residential fire suppression system
TYCO, 301	Fire protection products
TYCO Thermal Controls, 412	
Underwriters Laboratories Inc., 1009	Safety information and services
Unique Fire Stop Products 1529	Unique Sleeve Systems for Fire Barrier Protection
Uponor Wirsbo, 330	Residential sprinkler systems
USA Tank Storage Systems, 1311	Bolted Steel Tank, Tank Heaters, Tank Insulations
Vibro-Meter, Inc., 1023	Fire detectors
Watts/ Ames Company, 1035	Flow control products
Westex Inc. 443	Flame Resistant Material
Wet or Dry Tank Inspection, 332	Inspections
Wheelock Inc., 201	Fire alarm notifications
Williams Fire & Hazard Control, 1334	Fire fighting supplies
Witzenmann 1338	Flexible Fire Protection Sprinkler Systems
Xerxes Corporation, 1520	Fiberglass underground storage tanks
Zero International 1446	Intumescent firestop products

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NFPA's mission is to reduce the world-wide burden of fire and other hazards on the quality of life by providing and advocating scientifically based consensus codes and standards, research, training, and education.

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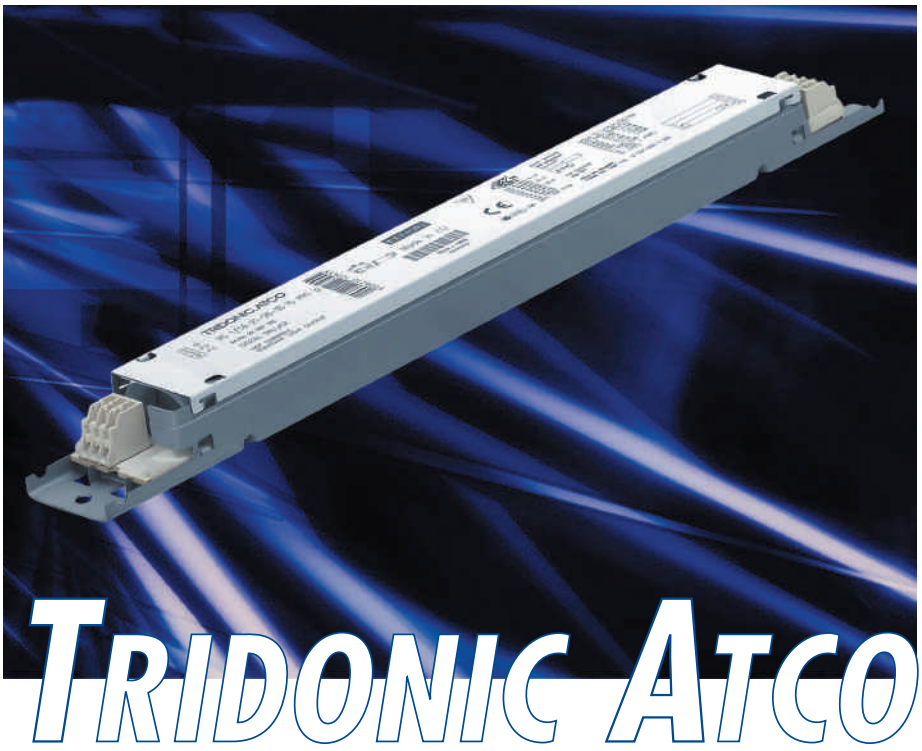

Emergency lighting control with peace of mind

Emergency lighting systems are a critical element in ensuring the safety of a building's occupants. Two new ranges from Tridonic.Atco offer higher levels of performance and reliability whilst also helping to reduce through-life costs.

It is essential that emergency lighting systems are always ready to perform reliably in the event of fire or power failure. With the introduction of the EM PRO and EM Selftest ranges, Tridonic.Atco offers increased functionality, reliability and peace of mind – combined with significant reductions in maintenance costs.

EM PRO

The new intelligent EM PRO family of emergency lighting modules is a range of technologically advanced emergency lighting control units designed to give total control of the testing and reporting functions within emergency lighting installations. When integrated into a lighting system based on the DALI interface, it provides access to the entire functionality of the advanced control and monitoring that DALI provides. This includes individual addressability so that detailed information on the emergency luminaires can be monitored.

As a result, in addition to standard information such as indicating faults on the lamp, control gear or battery, the system can provide information on, for example, the device status, type of lamp and type of emergency unit and battery.

The functionality of EM PRO emergency lighting control units offers considerable benefits, particularly for large lighting systems. With conventional emergency lighting control systems, even those with self-test functions, a visual check is required to determine whether an emergency lighting unit has signaled a fault. With the DALI system, information on the operating status can be displayed centrally, together with the precise address. The fault can then be efficiently corrected with considerable savings in terms of time and maintenance costs, while ensuring the building operator meets statutory requirements.

The EM PRO system can be used on a stand-alone basis or linked to a larger network and Windows software is available for controlling and monitoring the systems on a personal computer. In the case of large emergency lighting systems, interface units and a backbone network provide the links to the EM PRO modules.

Another benefit is the small cross section of the control units, just 30mm x 21mm, making them ideal for installation in small luminaires.

EM Selftest

Tridonic.Atco's new EM Selftest module uses power control technology to provide specifiers and end users with a high level of flexibility and reliability for the control of emergency lighting. In particular, it enables specifiers to standardise on the emergency lighting control and testing system throughout an installation, for many different types of luminaire, while eliminating the need for manual testing of emergency lighting.

Its innovative features include compatibility with amalgam and non-amalgam linear and compact fluorescent lamps, suitability for use with nickel cadmium and nickel metal hydride batteries, self-commissioning and self-testing features, a low profile design for use with T5 luminaires and 5-pole technology for enhanced safety and performance.

It is suitable for use with lamps from 4W to 80W and incorporates an intelligent charging system to provide pre-conditioning, fast charge mode and maintenance mode for trickle charging. Control start technology ensures that lamps reach maximum light output almost immediately on switching to emergency operation.

The auto test standard pr IEC 62034 stipulates that a commissioning test must be conducted after installation. EM Selftest automatically monitors the installation phase and, once the permanent supply has been connected for more than five consecutive days it will commence its commissioning and timing programme.

In self-test mode, the module uses a simple combination of red and green LEDs. Each week at a predetermined time the EM Selftest unit initiates a 30 second test to establish the functionality of the unit, battery and lamp. Under normal conditions the unit will delay the test until the normal lighting supply has been switched off for longer than two minutes – minimising the risk of the test being carried out while the occupier is present. In the event that the supply is permanently connected or the lights are left on permanently the unit will "force" a function test after a further 24 hours.

The unit also incorporates an adaptive mode to monitor normal room occupancy, so that annual duration tests are carried out at the optimum time.

For more information please contact:

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European Fire Sprinkler Network

By Alan Brinson

EUROPEAN FIRE SPRINKLER NETWORK

THERE HAS NEVER been more interest in sprinklers. Although they have been around for well over 100 years, in Europe most sprinklers have been fitted to save property from damage by fire. The driving force for them to be installed at all has usually been the insurer of the property risk, or occasionally the enlightened owner. This is now changing as legislators begin to consider sprinklers as part of their overall strategy to reduce fire deaths and injuries. The European Fire Sprinkler Network supports this positive development.

SPRINKLER PERFORMANCE

With so many years of field experience, insurers, laboratories, fire services and others have been able to collect statistics, in many different countries, to assess the performance of fire sprinkler systems. Comparisons have been made between performance in different types of protected risk, between new and old systems and between different types of systems. Figures vary a little but on average show that sprinkler systems control or extinguish fires in 98% of cases. Although CEA, the European Insurers Association, shows figures closer to 90% it comments that their data exclude many fires which were controlled or extinguished by the sprinkler system before the damage exceeded the excess on the policy. The true performance figure is therefore certainly much higher. By coincidence the latest sprinkler performance study, which was carried out by the Danish DIFT laboratory, also came up with 98%. DIFT recommends that fire engineers use this figure for designs involving sprinkler systems in Denmark.

Controlling or extinguishing fires in 98% of cases saves lives, reduces injuries and saves property. Since most sprinkler systems have been fitted to prevent property damage, more data is available for property. Insurance data typically shows that property losses from fire in a category of building are reduced on average by 80% if sprinklers are fitted. Factory Mutual recently claimed at a conference in Brussels that their engineers calculate a reduction in property losses by a factor of 6, or 83%.

Most data on the reduction in loss of life from the fitting of sprinkler systems comes from the United States. Scottsdale, Arizona, which for over 15 years has combined the widespread fitting of sprinkler systems with rigorous enforcement, has never had a loss of life in a sprinklered building. It also claims, "The average loss for a fire incident in a building protected with an automatic sprinkler system was over 90% less than the average loss for a structure fire incident without automatic sprinkler protection." Similar figures were reported by Prince George's County, Maryland, which since 1992 has required that sprinklers be fitted in all new construction.

It is this performance of sprinklers and the potential saving of life that has caught the attention of legislators. In many countries in Europe this has lead to initiatives to reduce the impact of fire by the use of sprinkler systems. Today over 10 million sprinklers are installed each year in Europe and the number is growing. However, most are still installed in the workplace or in public buildings. Where national fire loss statistics are available, they consistently show that 70-80% of fire deaths occur at home. Until we begin to install sprinklers in our homes, we will not realise the full potential they offer to save us from fire.

EXISTING REQUIREMENTS FOR SPRINKLERS

Before a look at expected improvements to legislation and building codes across Europe, it is worth noting that there are already many requirements to fit sprinklers in certain buildings, although these differ widely. Sadly these requirements were often introduced in response to a disaster, rather

> *"The average loss for a fire incident in a building protected with an automatic sprinkler system was over 90% less than the average loss for a structure fire incident without automatic sprinkler protection."*

than to prevent one. It is also disappointing that countries seem not to learn from each other. Here is a selection of existing types of building in which some countries require sprinklers to be fitted:

AIRPORTS

Following the fatal fire at Düsseldorf airport in 1996, most European countries now fit sprinkler systems in new airports or to major extensions. Even Heathrow Terminal 5 is expected to be fitted with sprinklers, making Charles de Gaulle the only major European hub without a sprinkler policy. Germany now requires sprinklers in large public spaces.

SHOPPING CENTRES

Belgium, Denmark, France, Germany, Norway, Poland, Spain and the UK require or encourage the use of sprinkler systems in shopping centres as a means to achieve fire safety. Belgium introduced its requirement for sprinklers following the fatal fire in the Innovation department store in Brussels in the 1970s.

WAREHOUSES

Denmark, France, Germany, Norway and Spain all require sprinkler systems in large warehouses. It is claimed in Germany that this is to protect firefighters who may enter the warehouse.

HOTELS

Norway requires sprinklers in hotels over 800m^2 and Spain requires them in hotels above 28m high. Finland reduces compartmentation requirements if sprinklers are fitted in hotels.

On the instructions of local fire chiefs, many care homes in Finland are being retrofitted with sprinklers. This is in response to some fatal fires. Norway is also looking at care homes.

NEW REQUIREMENTS FOR SPRINKLERS

Across Europe the main new applications where sprinklers are being fitted are care homes and residential accommodation.

On the instructions of local fire chiefs, many care homes in Finland are being retrofitted with sprinklers. This is in response to some fatal fires. Norway is also looking at care homes. In December 2003 the Norwegian government announced a requirement for the retrofit of hundreds of retirement and care homes in converted buildings, because they did not comply with current safety standards. There is considerable interest in the fire safety of care homes in France, where a care home owner recently received a jail sentence after 13 residents died in a fire. The first step has been to write a standard for the fitting of sprinklers in care homes. In the UK a study by the Building Research Establishment for the British government is expected to conclude that there is an economic case to fit sprinklers in care homes. This study will inform the review of the building code for England and Wales, expected to start this year.

In December 2003 the Norwegian government announced a requirement for the retrofit of hundreds of retirement and care homes in converted buildings, because they did not comply with current safety standards.

The issues in a care home are the inability of the occupants to evacuate the building and the lack of staff, particularly at night, to assist them to do so. Sprinkler systems will control or extinguish the fire, buying time for the emergency services to intervene before conditions become life-threatening.

The Netherlands is a very crowded country and so recently high rise residential accommodation has become popular with developers. Fire Chiefs are concerned about the safety of their men and their ability to be effective if they must first climb many flights of stairs wearing breathing apparatus to reach the fire and begin to evacuate people. These buildings are therefore being fitted with sprinklers. Other new apartment buildings are also being fitted with sprinklers, since Dutch guidelines allow relaxation in many other fire safety measures if sprinklers are fitted. The relaxations include fire compartment resistance and size, the fire resistance of load-bearing members, escape travel distance, minimum number of exits and the maximum distance between fire hydrants. Not all these measures can be relaxed together but they can lead to the fitting of a sprinkler system becoming the economic option for the developer.

Norway and Sweden are also beginning to fit sprinklers in new residential buildings. In some cases this is to permit three storey constructions in wood.

NEW DESIGN AND PRODUCT STANDARDS

In parallel with the developments in national legislation and building codes, new standards for the design of sprinkler systems and components are being written. The best known of these standards are CEN 12845 for the design of sprinkler systems and CEN 12259 for

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the components used in sprinkler systems. Much has been written about the content of these standards but little about why we need them. The legal need for them is to enable sprinkler systems to comply with the Construction Products Directive. Another benefit from the existence of European standards for components is that manufacturers no longer need to design and approve different sprinklers and valves for different national markets. This brings down costs for everyone.

CEN 12845 has been printed and put on sale in the UK. Meanwhile Germany rejected this standard because of confusion about a concept known as sprinkler kits. This confusion now looks to be resolved and a definition that was earlier accepted by the sprinkler industry but rejected by the European Commission will be reinstated. National governments now have three years to withdraw any competing standards and so we can expect that the standards will gradually be translated and formally adopted across Europe. Italy intends to begin translation in the summer.

For those who wish to see the widespread use of sprinkler systems, the existence of design and product standards brings a further benefit, because legislators usually require a technology to be defined before they will require its use.

For this reason the European Fire Sprinkler Network hopes that the current standards are soon updated to include modern, efficient sprinklers, such as ESFR sprinklers, sprinklers with k-factors above 115, extended coverage sprinklers and residential sprinklers. All these sprinklers reduce the cost of sprinkler systems and so the resistance to their use.

Until the CEN standards are updated to include the full range of sprinklers now on the market, designers and authorities are forced to refer to other standards. The European Insurance Association, CEA, has a design standard for k-200 ESFR systems, which is widely invoked in Germany, as is TB 209 from the FPA in the U.K. and R-1 from APSAD in France. Other countries use NFPA13 or FM design rules.

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France has recently written a design standard for the fitting of sprinkler systems in retirement homes at the request of the French Insurance Federation. French Fire Chiefs and government representatives contributed to the drafting of this standard, which uses residential sprinklers and accepts listings from agencies such as Underwriters Laboratories. Similarly the Netherlands, Sweden and UK have produced standards or guidelines for the fitting of sprinklers in residential accommodation, while Norway uses NFPA13R and NFPA13D.

THIRD PARTY CERTIFICATION OFTEN ABSENT

While the CEN standards only consider technical issues, some of the other standards also consider the required qualifications for installers of sprinkler systems. Sprinkler system component product quality and consistency is rigorously enforced by a few third party accredited laboratories. By contrast in many European countries there is no independent approval of designs or installers, nor inspection of installed systems. The European Fire Sprinkler Network encourages those countries to introduce third party inspection, to ensure the remarkable performance record of sprinkler systems is maintained.

For those who wish to see the widespread use of sprinkler systems, the existence of design and product standards brings a further benefit, because legislators usually require a technology to be defined before they will require its use.

THE WAY FORWARD

Sprinklers are not a panacea: they are just another tool for the fire safety practitioner to design safe buildings. But properly used they can be very cost effective and greatly improve fire safety. This is now being recognised. Today in many European countries fire safety expert groups made up of legislators, the fire services, consultants, insurers and the sprinkler industry jointly discuss fire safety challenges. The European Fire Sprinkler Network has been set up to foster this cooperation, bringing information to fire safety experts across Europe in the belief that we can learn from each other. Each year in Europe fire claims at least 3,000 lives and over €10 billion in property damage. The targeted but widespread use of sprinkler systems could dramatically reduce these losses. More and more fire safety legislators now accept this and are considering revisions to building codes that will encourage or require the fitting of sprinklers.

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Substitutes for Halon 1211 in Streaming Applications

By Mark L. Robin
Hughes Associates, Inc.

DURING THE PAST 30 years, the use of the clean fire suppression agent Halon 1211 in streaming applications has prevented the loss of human life, and Halon 1211 systems currently protect billions of dollars worth of equipment worldwide. However, because of its implication in the destruction of stratospheric ozone, the production of Halon 1211 was banned in developed countries commencing on January 1, 1994. As a result, intensive research efforts have been undertaken in the industrial, academic, and governmental sectors with the goal of developing substitutes for this valuable suppression agent.

The ideal Halon 1211 substitute, in addition to possessing the desirable characteristics of Halon 1211 itself, is required to have a much lessened environmental impact with regard to its potential for ozone depletion, and also with regard to its potential for contributing to global warming. Hence, one possible set of requirements for the ideal Halon 1211 substitute is as follows:

1. Highly efficient fire suppression
2. Clean extinguishment (no residue)
3. Zero ozone deletion potential (ODP)
4. Nonconducting
5. Storage stable
6. Non-toxic
7. Zero global warming potential (GWP)
8. Manufacturable at reasonable cost

To date no substitute has been found which satisfies all of the above requirements, although substitutes have been found which satisfy some of the above criteria.

SUBSTITUTES FOR HALON 1211

Table 1 lists those substitutes currently approved for use as streaming agents under the U.S. EPA Significant New Alternatives Policy (SNAP). Table 2 shows those substitutes approved for use as streaming agents under SNAP which are subject to narrowed use limits. Substitutes subject to narrowed use limits are acceptable for use only in certain applications, for example, in applications where other alternatives are not technically feasible due to performance or safety requirements. For details on the narrowed use limits for individual substitutes listed in Table 2, see the U.S. EPA website(http://www.epa.gov/ozone/snap/fire/lists/stream.html).

Under current SNAP guidelines, hydrochlorofluorocarbons (HCFCs) cannot be employed in residential extinguishers, but are allowed in commercial, watercraft and aircraft use in portables.

Due to their non-zero ODP, HCFCs are currently scheduled for a production phase-out by 2030.

Under SNAP guidelines, perfluorocarbons (PFCs) are acceptable for nonresidential use only when other alternatives are not technically feasible.

It should be noted that not all of the agents listed in Tables 1 and 2 are clean agents. For example, water, foam, dry chemical and the gelled halocarbon/dry chemical suspension will leave a residue following extinguishment which must be cleaned up.

Two of the more popular Halon 1211 substitutes are Halotron® I and FE-36™.

Table 1. Agents Acceptable Under SNAP as Substitutes for Halon 1211 in Streaming Applications

Substitute	Tradename	Manufacturer	Chemical Formula	Approved for Residential Use?	Contact Information
HCFC-123	FE-232	DuPont	CF_3CHCl_2	NO	www.dupont.com
HCFC-124	FE-241	DuPont	CF_3CHFCl	NO	www.dupont.com/fire
HCFC Blend B	Halotron I	American Pacific Corp.	3 component blend based on HCFC-123	NO	www.halotron-inc.com
HCFC Blend C	NAF P-III	NAF Int'l/ Safety Hi-Tech	55% HCFC-123 31% HFC-124 10% HFC-134a 4% D-limonene	NO	www.safetyhitech.com
HCFC Blend D	Blitz III	NAF Int'l/ Safety Hi-Tech	HCFC-123 plus proprietary additive	NO	www.safetyhitech.com
Gelled Halocarbon/ Dry Chemical Suspension	Envirogel	Powsus	Halocarbon plus dry chemical plus gelling agent	YES	www.powsus.com
Surfactant Blend A	Cold Fire	Firefreeze Worldwide, Inc.	Mixture of organic surfactants and water	YES	www.firefreeze.com
Carbon dioxide	–	–	CO_2	YES	–
Water	–	–	H_2O	YES	–

Table 2. Agents Acceptable Under SNAP as Substitutes for Halon 1211 in Streaming Applications Subject to Narrowed Use Limits

Substitute	Tradename	Manufacturer	Chemical Formula	Approved for Residential Use?	Contact Information
Water Mist Systems	Hi-Fog	Marioff	H_2O	YES	www.hi-fog.com
	Fire-Scope 2000	Securiplex	H_2O	YES	www.securiplex.com
	–	Yates Fire Protection	H2O	YES	P.O. Box 9206, Hampton, VA 23670
Foam	–	–	–	YES	–
Dry Chemical	–	–	–	YES	–
HCFC Blend E	NAF P-IV	NAF Int'l/Safety Hi-Tech	90% HCFC-123 8% HFC-125 2% D-limonene	NO	www.safetyhitech.com
HFC-227ea	FM-200	Great Lakes Chemical	CF3CHFCF3	NO	www.fm-200.com
	FE-227	DuPont	CF3CHFCF3	NO	www.dupont.com/fire
HFC-236fa	FE-36	DuPont	CF3CH2CF3	NO	www.dupont.com/fire
FIC-13I1	Triodide	Ajay North America	CF3I	NO	www.CF3I.com
FC-5-1-14	CEA-614	3M	C6F14	NO	www.3m.com
C6-Perfluoroketone	Novec 1230	3M	$CF_3CF_2C(O)CF(CF_3)_2NO$	www.3m.com	
Hydrofluoro-polyethers	H-Galden HFPEs	Solvay Solexis	Hydrofluoro-polyethers	NO	www.solvayplastics.com

These agents are suitable for typical streaming applications, including the protection of high-value assets such as computer rooms, process control rooms, laboratories and aircraft. Halotron® I, produced by American Pacific Corporation, is an HCFC-123 (CF_3CHCl_2) based mixture containing minor quantities of argon and carbon tetrafluoride (CF_4). Halotron® I has been approved by the U.S. Federal Aviation Administration (FAA) for airport fire fighting (on flight lines and at gates) and more than 50 U.S. airports employ 460-500 pound Halotron® I systems on their aircraft rescue and fire-fighting (ARFF) vehicles. Halotron I has been approved by the U.S. FAA for on-board use in a UL listed portable, and United States Coast Guard (USCG) approved portable units are available. Halotron® I units are available with UL ratings ranging from UL 1B:C portable units up to UL 10A 80B:C wheeled units.

FE-36™, produced by DuPont, is the hydrofluorocarbon HFC-236fa ($CF_3CH_2CF_3$). FE-36™ is a zero ODP replacement for Halon 1211 and has been approved by the U.S. FAA for on-board use in a UL listed portable. FE-36™ has also been approved for use auto racing applications. In the U.S., FE-36™ portable units are available with UL ratings ranging from UL 2B:C to UL 2A 10B:C. All UL listed FE-36™ portables are United States Coast Guard (USCG) approved. In Europe, EN3 listed units are available with 34B, 5A:55B and 8A:70B ratings.

Table 3. Fire Suppression Efficiency: Halon 1211, Halotron® I and FE-36TM

UL Rating	Kilograms of Agent Required for UL Rating		
	Halon 1211	Halotron I	FE-36
2B:C	0.6	1.1	1.1
5B:C	1.1	2.3	2.2
1A 10B:C	4.1	5.0	4.3
2A 10B:C	–	7.0	6.0
2A 40B:C	5.9	–	–
4A 60B:C		29.5	–
4A 80B:C	7.7		
10A 80B:C	–	68.0	–
30A 240B:C	68.0	–	–

Table 3 compares the extinguishing efficiencies of Halon 1211, Halotron® I and FE-36™, and Table 4 compares the environmental and toxicological characteristics of the three agents. In Table 4 the NOAEL (no observed adverse effect level) is the highest concentration at which no adverse toxicological or physiological effect has been observed; the LOAEL (lowest observed adverse effect level) is the lowest concentration at which an adverse toxicological or physiological effect has been observed.

Table 4. Comparison of Toxicological and Environmental Properties

Property	Halon 1211	Halotron® I	FE-36TM
ODP	3	0.014[a]	0
GWP (100 year integrated time horizon)	1300	CF_3CHCl_2 = 120 CF_4 = 5700 Ar = 0	9400
Atmospheric Lifetime, years	11	CF_3CHCl_2 = 1.4 CF_4 = 50,000 Ar = 0	220
NOAEL	0.5	1	10
LOAEL	1	2	15

[a] based on HCFC-123

RECENT ADDITIONS

The two most recent additions to the list of SNAP approved streaming agents are the H-Galden hydrofluoropolyethers (HFPEs), produced by Solvay Solexis, and the perfluorinated ketone agent Novec™ 1230, produced by 3M Corporation. The H-Galden HFPEs are low molecular weight linear fluorinated polyethers capped on both ends with hydrogen, and are characterized by zero ODP and low GWP.

Novec™ 1230 is the fluorinated ketone 1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone, marketed by 3M. Novec™ 1230 is rapidly decomposed by interaction with the ultraviolet radiation from the sun, and as a result, the atmospheric lifetime and GWP of the agent are low. 3M has reported an atmospheric lifetime of approximately five days, and a GWP of 1. Novec™ 1230 contains no bromine or chlorine, and hence it has an ozone depletion potential (ODP) of zero.

CONCLUSION

In response to the production ban on Halon 1211, numerous Halon 1211 substitutes have been developed and commercialized. With the advent of these new agents, businesses worldwide will continue to have the ability to protect critical equipment and irreplaceable items, despite the ban and inevitable disappearance of Halon 1211 from the marketplace.

Mark L. Robin

3M Novec™ 1230
Fire Protection Fluid

Zero ozone depleting
fire protection
from Hygood

The dynamic new solution

- Zero ozone depleting potential
- Insignificant global warming potential
- Safe for occupied areas
- Atmospheric lifetime of less than 5 days
- Replaces existing halon systems
- Requires minimal storage space
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Tel: +44 (0)1493 859822 Fax: +44 (0)1493 858374
Email: macron-info@tycoint.com Web: www.macron-safety.com

New Tools for Confined Space Entry

By Meg Godfrey, Product Manager, Portable Products, RAE Systems

THE INDUSTRIAL ENVIRONMENT has changed substantially since the U.S. Department of Labor's Occupational Safety & Health Administration (OSHA) first defined confined space entry (CSE) regulation. Nowadays, toxic industrial compounds are major constituents or by-products of modern industrial products and processes and the standard two-gas detection monitor does not afford sufficient protection to employees. Monitors that measure only oxygen and combustibles are letting common, devastating toxins slip through the safety net exposing workers, families, and communities to unnecessary illnesses and deaths.

What Is a Confined Space?

Confined space entries are part of a daily routine throughout the industrial workplace. A confined space is defined as a space that:

- Is large enough for an employee to enter and perform work.
- Has limited or restricted means for entry or exit.
- Is not designed for continuous human occupancy.

Examples of confined spaces:

- Storage tanks and vessels
- Sewers and manholes
- Underground utility vaults
- Agriculture silos
- Railcar tanks
- Marine vessel tanks
- Tunnels
- Grain elevators

Atmospheric hazards in a confined space are those which expose entrants to risks such as death, entrapment, injury, or acute illness from one or more of the following causes:

- An atmospheric oxygen concentration below 19.5% (oxygen deficiency), or above 23.5% (oxygen enrichment)
- A flammable gas or vapor in excess of 10% of its lower explosive limit (LEL) yet still remaining below the upper explosive limit UEL)
- An atmospheric concentration of any toxic containment above the OSHA permissible exposure limit (PEL)

What Is the Risk?

When two-gas confined space monitors first hit the safety market, the goal was to stop fatalities in confined spaces due to the acute (immediate) affects of toxic or explosive gases. Simply put, LEL sensors made sure that workers got

Could these lives have been saved if a PID had been used in conjunction with a standard four-gas monitor?

■ Two workers were poisoned while cleaning an aluminum trailer tank with a phosphoric acid solution. The tank had been used 6 months previously for the transport of a 42% solution of sodium arsenite (weed killer). Since that time it had been cleaned with steam and detergent, and used for storage and transportation of alcohol and other industrial solvents. Before assigning the trailer to another client, a thorough cleaning job was ordered, which required the hand application of the acid cleaner. Subsequently, arsine was generated by a reaction between the acid cleaner and the aluminum which had arsenic impurities.

■ Three contract workers died while repairing the interior rubber lining of a sodium hypochlorite tank at a waste water treatment plant. The workers were working in a confined space, using extremely toxic and flammable chemicals (toluene, xylene, methanol, isopropanol, and methyl ethyl ketone). Since the workers did not have an atmospheric gas testing instrument, the plant maintenance engineer provided one capable of detecting oxygen, flammability, and hydrogen sulfide. Two days later, the workers were found dead inside the tank. The medical examiner listed the cause of death for all three workers as toluene poisoning.

■ Three workmen were cleaning out a trichloroethylene degreasing tank. The tank is only cleaned out when the plant is not in operation, therefore, only the three assigned the cleaning task were in the plant. A relative of one of the workers stopped by the plant that evening and found all three workmen down in the tank and unresponsive. One was dead when removed, one died a few hours later at a local hospital, and one remained critical for a month and then died without regaining consciousness.

■ A 34-year-old male painter died when he apparently inhaled vapors from paint containing xylene, lost consciousness, and fell 140 feet within the vertical water supply pipe of a municipal water tower.

home at night. Now, however, CSE professionals are becoming increasingly concerned about the chronic (long-term) affects of many gases and vapors. More than 80% of the gases and vapors listed in OSHA's "Toxic and Hazardous Substances" are volatile organic compounds (VOCs) or hydrocarbons. And while most of these compounds are indeed flammable, they are acutely toxic at concentrations in the parts-per-million (ppm) range – generally well below any combustible threshold that could be detected by the typical monitor.

What are some common VOCs?

VOCs are the chemical compounds that keep industry going and include:

- Fuels
- Oils, Degreasers, Heat Transfer Fluids
- Solvents, Paints
- Pesticides, Herbicides
- Plastics, Resins and their precursors

VOCs are found throughout industry, from obvious applications in the petrochemical and semiconductor industries to not-so-obvious applications such as sausage manufacturing.

Compound	LEL by volume	LEL ppm	10% LEL L (ppm)	TWA[1] (ppm)	TWA in % LEL
Ammonia	15%	150,000	15,000	50	**0.03%**
Arsine	5.1%	51,000	5100	.05	**0.0001%**
Benzene	1.2%	12,000	1200	1	**0.008%**
Diesel	.7%	7,000	700	13	**0.19%**
Isopropyl Alcohol (Isopropanol)	2.0%	20,000	2000	400	**2%**
Jet Fuel	.6%	6,000	600	35	**0.58%**
Methyl Ethyl Ketone	1.4%	14,000	1400	200	**1.4%**
Styrene	0.9%	9,000	900	20[2]	**0.22%**
Toluene	1.1%	11,000	1100	50	**0.45%**
Trichloroethylene (TCE)	8%	8,000	800	100	**1.25%**
Vinyl chloride	3.6%	36,000	3600	1	**0.0028%**
Xylene	1.1%	11,000	1100	100	**0.9%**

[1]TWA – Time-weighted average maximum exposure concentration for a conventional 8-hour work day, OSHA 1910 Subpart Z – Toxic and Hazardous Substances
[2]ACGIH®, 2002

Why Not Use an LEL Monitor?

Many VOC's *are* flammable and may be detected by the LEL (Lower Explosive Limit) or combustible gas sensor found in virtually every multigas monitor – but not necessarily before they reach toxic levels. As the following chart shows, many common VOCs and hydrocarbons present a serious toxicity hazard at concentrations considerably below their 10% LEL alarm limit.

For many common compounds, TWA alarm conditions are reached at concentrations several orders of magnitude below LEL. Add to this the fact that LEL sensors typically have an accuracy of +/- 3% of the reading and it is clear

that LEL sensors do not provide sufficient protection from unanticipated gaseous threats. LEL sensors measure "explosivity", not toxicity.

Detecting gases at these low concentrations requires gas measurement tools that measure in parts-per-million (ppm).

PIDs – Accurate, Sensitive Detection of Classes of Toxins

Photo Ionization Detectors (PID's) measure low levels – 0 to 10,000 parts-per-million – of VOCs (Volatile Organic Compounds), hydrocarbons and other classes of toxic gases. They provide compact, sensitive, accurate, affordable and reliable real-time gas monitoring of many of the common toxic gases and vapors that four gas monitors miss.

PID – Choosing "Broad-Band" over Specificity

Some say that while the PID is clearly sensitive to many toxic gases and vapors at ppm levels, its lack of selectivity reduces its usefulness. For many applications, that lack of specificity is, in fact, a life saver. CSE technicians who have the right equipment and follow the regulations are protected from the anticipated dangers – lack of oxygen, threat of combustion. The advantage of the PID is that it is not selective; able to detect a broad spectrum of VOCs and hydrocarbons, it is a highly portable, continuous-operation monitor that provides immediate feedback to workers concerning unseen and unanticipated threats. This lets them take control of their actions and lets them perform their job tasks with the confidence that they are not being exposed to hazardous chemicals. The PID measures continuously and results can be stored and "played-back", instantly.

PIDs Respond Instantly to Transient Exposures

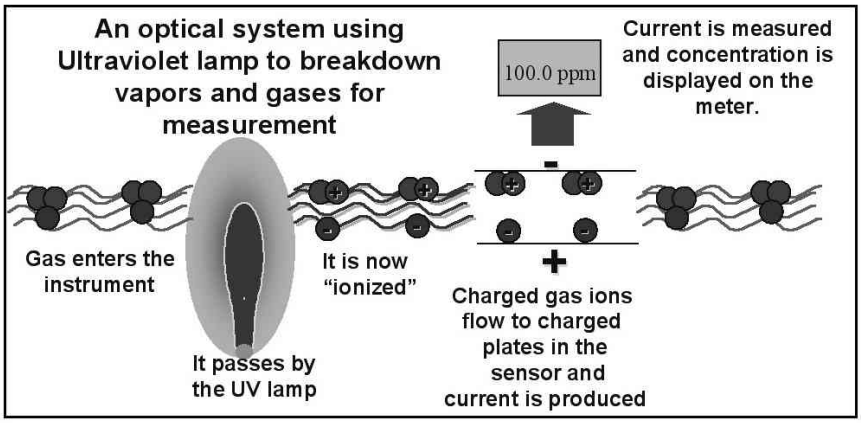
Adsorbent tubes respond slowly to changes in concentration. This means that they can miss, or grossly underestimate some exposures. For example, suppose a worker's task involved periodically leaning into a degreasing machine. While leaning into the machine, the worker was exposed to 300 ppm of perchloroethelyne for 10 seconds. This quick exposure certainly has toxic affects on the worker, but the slow response of adsorptive sampling techniques, coupled with their averaging, may completely miss this practice. A PID, not only could datalog these quick, high transient responses, but can provide alarms to alert the operator to this unsafe procedure.

PID Provides Workers with Alarms

PIDs provide instantaneous alarms so that workers can take immediate action. Chemical vapor safety is no longer delivered in a disciplinary manner by an industrial hygienist; instead it is a proactive part of the workday. Adsorptive techniques are reactive rather than proactive. By the time that the data is available, the worker has already been exposed.

How does a PID work?

A PID uses an ultraviolet light source to break down chemicals into positive and negative ions that can easily be counted with a Detector. The detector measures the charge of the ionized gas and converts the signal into current. The current is then amplified and displayed on the meter as "ppm." After



measurement the ions reform the original gas or vapor. PIDs are non-destructive; they do not "burn" or permanently alter the sample gas, which allows them to be used for sample gathering.

Ionization Potential

All elements and chemicals can be ionized, but they differ in the amount of energy required to cause ionization. The energy required to displace an electron and "ionize" a compound is called its Ionization Potential (IP), measured in electron volts (eV). The light energy emitted by an UV lamp is also measured in eV. If the IP of the sample gas is less than the eV output of the lamp, then the sample gas will be ionized.

IPs can be found in the NIOSH Pocket Guide, PID manufacturer literature or in many chemical texts.

What does a PID Measure?

The largest group of compounds measured by a PID are the Organics – compounds containing Carbon (C) atoms – including the following:

- **Aromatics** Compounds containing a benzene ring including benzene, toluene, ethyl benzene and xylene.
- **Ketones** and **Aldehydes** Compounds with a C=O bond including acetone, methyl ethyl ketone (MEK) and acetaldehyde.
- **Amines** and **Amides** Carbon compounds containing nitrogen, like diethylamine.
- **Chlorinated hydrocarbons** Trichloroethylene (TCE), perchloroethylene (PERC)
- **Sulfur** compounds Mercaptans, sulfides
- **Unsaturated hydrocarbons** Butadiene and isobutylene
- **Alcohols** Isopropanol (IPA) and ethanol
- **Saturated hydrocarbons** Butane and octane

In addition to organic compounds, PIDs can be used to measure some Inorganics. These are compounds without carbon and include:

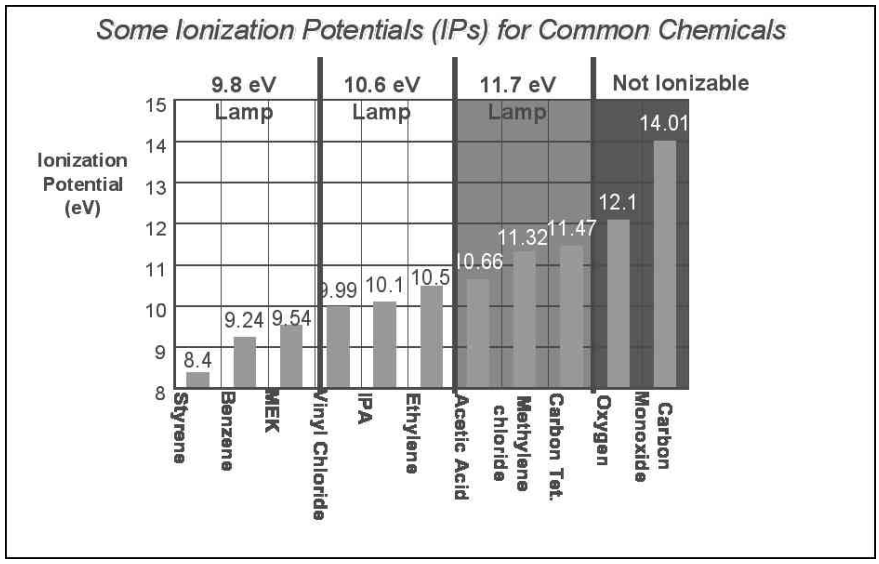
- **Ammonia**
- **Semiconductor gases** Arsine, Phosphine
- **Hydrogen sulfide**
- **Nitric Oxide**
- **Bromine** and **Iodine**

What PIDs Do Not Measure

- Radiation
- Air (N_2, O_2, CO_2, H_2O)
- Common Toxics such as CO, HCN, SO_2
- Natural Gas (Methane, Ethane)
- Acid Gases (HCl, HF, HNO_3)
- Others- Freons, Ozone (O_3), Hydrogen peroxide
- Non-volatiles: PCBs, Greases

PIDs are a Powerful Tool!

PIDs are now capable of measurements from 0 to 10,000 ppm with resolution as low as 1 ppb (parts-per-billion). They are a powerful means of detecting and measuring VOCs and other toxic gases and vapors at concentrations far lower than LELs. PID technology, coupled with the standard Two-Gas monitor provides CSE professionals powerful, affordable, portable protection from unanticipated as well as anticipated threats. The PID's ability to provide accurate "broad band" detection of a host of common, highly toxic compounds makes it a necessity in today's modern industrial environment.



References

NIOSH: *Pocket Guide to Chemical Hazards,* NIOSH Publications, Cincinnati, OH 1994

DHHS (NIOSH) Publication No. 79-142, 2002 *Worker Deaths in Confined Spaces-A Summary of NIOSH Surveillance and Investigative Findings*, January, 1994, DHHS (NIOSH) Publication No. 94-103

OSHA 1910 Subpart Z – Toxic and Hazardous Substances

Guide to Occupational Exposure Values – 2002, compiled by ACGIH

NFPA 325, Guide to Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids, 1994 Edition

RAE Systems: Correction Factors and Ionization Potentials (Technical Note TN-106)

RAE Systems: AP-211: PIDs for Continuous Monitoring of VOCs

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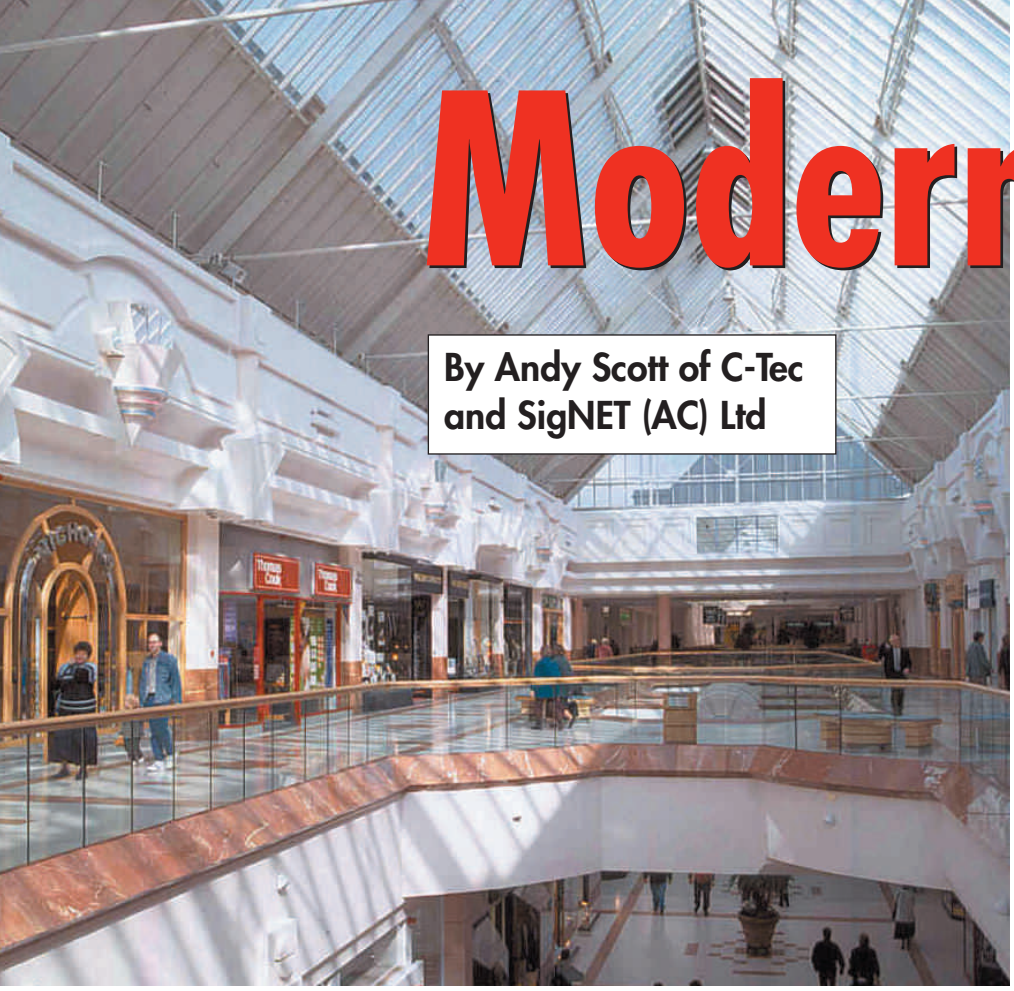
Modern Evacu

By Andy Scott of C-Tec and SigNET (AC) Ltd



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IN OLDEN TIMES, if there were a fire, the alarm would be raised by someone shouting 'fire' and making a lot of noise. Early fire alarm systems were manual or manually operated with electro-mechanical sounders such as bells and sirens and the speech element of the warning was lost. In the last 40 years or so, automatic detection systems have arrived and nowadays most alarm sounders are electronic.

The problem with bells, sirens and sounders is that the message is, in effect, coded and numerous studies have shown that untrained people do not respond to a coded alarm unless they receive some form of confirmation as to what it means. Obvious forms of confirmation are smoke coming under a door or someone shouting 'fire', but it would be much better if there were no doubt as to the real meaning of the alarm in the first place.

THE EVACUATION PROCESS

Once an alarm has been raised, there are three phases to the evacuation process, recognition (of what the alarm means), response (deciding what to do, which might be to find the children rather than to leave immediately) and travel (moving to and through an escape route). A lot of this research is summarised in a BSI document, DD240 : 1997 Fire Safety Engineering in Buildings, section 1.This clearly shows that people react most quickly to a live speech warning as it is clearly not an unwanted alarm; they react quickly to recorded messages, as their meaning is clear; and they react much less quickly to bells and sounders. The difference in these recognition times is in the order of several minutes. There is a famous 'Equinox' TV documentary from several years ago that showed an experiment on groups of people in a closed room taking up to 11 minutes to react to a fire alarm bell – clearly an unacceptable state of affairs.

PHASED EVACUATION

Most small or simple buildings have a philosophy of alerting and evacuating all occupants at the same time. However, there are several situations where this is not practical and could be dangerous. For instance, if staircases in multi storey buildings were wide enough to evacuate all occupants safely at the same time they would have to get wider and wider nearer the bottom of the building, which is impractical.

Phased evacuation allows the people at most risk to be evacuated first, with others being alerted to the danger but evacuated in controlled phases later as necessary. Phased evacuation may also be desirable for commercial reasons, such as in shopping centres, where effective passive fire protection means that the risk to most occupants from a fire is low, and the cost to businesses caused by the disruption of an unwanted alarm is high.

The problem with phased evacuation is that different warnings need to be given and clearly understood. The most common warnings are; coded alert to tell the staff that there is an emergency without alerting the public; alert, to tell the public to prepare to be evacuated, but not to move yet; and evacuate itself. There is often a completely different 'bomb' warning as well and the action to be taken in case of this type of threat is likely to be completely different to the action taken in case of fire.

WHAT ARE THE OPTIONS FOR ALERTING PEOPLE?

1. Training

In individual buildings, occupants can be trained and regularly drilled to know what coded alarms mean and to act accordingly. Different signals can be used for phased evacuation if necessary. Training is an excellent idea, but it relies on building management to implement it and is disruptive if carried out diligently. It also assumes that the occupants are familiar with the building and motivated to take the training seriously. It is of little use when occupants change frequently and it has also been shown that even those who have been trained to react to an alarm in their place of work do not generally react promptly to an alarm in unfamiliar surroundings.

2. Use a common evacuation sound

We could all agree on specific alert and evacuation sounds and train the

ation Systems

Pic courtesy of SigNET (AC) Ltd

population on how to react, starting at school, where the school fire alarm system could be used as a training tool. This is also an excellent idea, but it would require strong political will to make it happen. There is no sign of this at the moment and it would also require the replacement of most existing sounders – which would be expensive and likely to be resisted unless the political pressure was very strong indeed.

ISO 8201 specifies an international evacuation (but not an alert) sound and France, Germany, Netherlands and Sweden have all adopted national alarm sounds, but they are not the same in each country, do not match ISO 8201 and do not match the recommendations in the UK.

With increased population mobility, common alert and evacuation sounds should surely be international and, although there are some attempts to make this happen, it is still many years, if not tens of years away from happening.

3. Use uncoded warnings

In other words, use speech. Recent reductions in the cost of electronics have made it practical to economically produce 'talking sounders' or, more properly, 'voice enhanced sounders'. These use an alert tone to precede one or more recorded messages and are a clear advance over 'coded' sounders. They can certainly be used in place of coded sounders to remove doubt as to the meaning of an alarm.

The disadvantage of most voice-enhanced sounders is that they cannot reproduce live speech and they are required to work off the restricted power supply of conventional fire alarm control panels. Therefore, they use technology such as piezo transducers to reduce current consumption, resulting in limited bandwidth and 'peaky' frequency response, which compromises their effectiveness. However, it is possible to process the signals to give acceptable intelligibility for use in simple acoustic environments.

4. Use a voice alarm system

This is the most effective solution in public places and large buildings where it is difficult to train the occupants because they are constantly changing, or in places of increased risk such as pharmaceutical plants, where there are many different hazards, each requiring different evacuation actions.

Voice alarm systems use amplifiers and distributed loudspeakers to deliver live and recorded messages with good intelligibility and they can also be used for other paging and music applications. The benefit of live announcements, especially when used in conjunction with CCTV systems, is that specific warnings can be made to areas where problems exist. In fact BS5588 part 10 requires that a voice alarm complying with BS5839 part 8 be installed in the malls of shopping complexes and used in conjunction with a CCTV system to make live announcements to those at particular risk.

BS5588 part 11 requires that a voice alarm system complying with BS5839 part 8 be installed in all phased evacuation situations so that there is no doubt what people should do. BS5588 part 7 requires voice alarm systems in large atriums and part 6 requires voice alarm systems in places of assembly, such as theatres.

Apart from the effectiveness of voice alarm systems in evacuating people safely, there may also be commercial advantages as the use of fire engineering principles means that in some applications, the much reduced recognition time can be 'traded' for an increase in travel time. In effect, fewer escape routes placed further apart, freeing up space for commercial activity. The money saved will generally well exceed the cost of the voice alarm system.

A brief history of Voice Alarm in the UK

VA systems were originally introduced at military installations in the Second World War but they first came into general use to provide bomb warning during the 1970 terrorist campaigns. Initially, they were mostly standard public address systems with standby batteries and some form of loudspeaker line monitoring added on.

They then started to be attached to fire detection systems but they often did not meet the fundamental requirements for reliability and fault monitoring employed in fire alarm systems. This was not necessarily due to 'cutting corners' but was largely because of the lack of clear installation and product standards. In 1998, the voice alarm installation standard, BS5839 part 8, was introduced and things improved greatly. However, there were still no voice alarm component standards and so it included some product guidance.

RELEVANT STANDARDS

In the UK, as previously mentioned, fire precautions and the need for fire alarm systems and voice alarms is covered by various parts of BS 5588 (6,7, 10 and 11). Fire alarm installations are covered by BS5839-1 : 2002 and components are mostly governed by the EN54 series of standards. Voice alarm installations are covered by BS5839-8 but there is also a European Standard, BS EN60849, which covers the installation of sound systems for all emergency purposes, not just for connection to a fire detection system. However, BS EN 60849 is fairly general and refers to 'local rules', which allows the UK to follow BS 5839-8. (Note that sports grounds on match days are covered by BS 7827, which covers overall crowd safety, not just in case of fire).

A new component standard, part 16-1 of EN54 (Voice Alarm Control and Indicating Equipment) is about to be released for public comment and part 16-2 (Voice Alarm Loudspeakers) should follow later in 2004. Once these standards are released, it will be easier for manufacturers and installers to competitively provide effective and compliant voice alarm systems and everyone will gain.

The BSI is currently considering revising BS5839-8. This is necessary to clarify some details but mainly in order to bring it into line with the new BS 5839-1. There is also a strong lobby for the creation of application categories for voice alarm systems. These should be similar to the categories in the new BS 5839-1 and should be used to help building designers decide what sort of solution should be used in any given case. In complex or high-risk situations, it should clearly require a risk analysis approach and possibly the use of fire engineering principles.

THE CURRENT SITUATION RE EVACUATION SYSTEMS

In the fire alarm industry the emphasis has quite rightly been on detection but, even though the installation standard has recently been heavily revised and improved, its recommendations regarding audible alarms has changed little since 1980.

There has been little interest in the evacuation process itself and evacuation systems, whether directly attached to the alarm system or manually operated (or both), should be considered as a whole, as is done in some other countries. Installation standards should more clearly say when a coded warning is acceptable, when an uncoded warning is required, and when live speech and good intelligibility are needed.

The perceived need for specialist audio and acoustic expertise has meant that the audio industry has continued to deal with voice alarms and few fire alarm companies have any real expertise in the field. However, acoustic design in most applications is not difficult and many fire alarm companies would be perfectly capable of designing systems if they had clearer guidelines to help them and to help them know when an

Pic courtesy of SigNET (AC) Ltd

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acoustic specialist should be used. Once BS 5839-8 has been revised, it is likely that the BFPSA will produce a suitable training course.

Many voice alarm systems are not maintained properly as many fire alarm companies who take on maintenance of a voice alarm do not do anything at all – some do not even realize that the system will have batteries that need to be checked.

Regular voice alarm system testing is rarely carried out properly. Operating a control that plays a test message is not acceptable as it does not test the emergency messages or the link from the fire detection system. The only real test it to operate a detector or manual call point and make sure that the correct messages play in the correct areas.

CONCLUSIONS

1. Voice enhanced sounders should replace coded sounders in the majority of simple applications but must not be used in place of proper voice alarm systems.
2. Voice alarm systems should be more frequently employed in larger buildings or complex evacuation situations and fire alarm companies should be given the tools to design, install and maintain these systems properly.

A NOTE ON THE STATUS OF EN60849

EN 60849 is the European Standard for Sound Systems for Emergency Purposes. ISO TC 100, which comprises mostly audio specialists, originated it and recently proposed a major revision. However, they received a large number of comments from the fire alarm industry, which has resulted in the work being transferred to ISO TC21, which deals with fire alarm systems. Work on a new international voice alarm standard to replace EN 60849 is due to begin soon.

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Technology...

Whether you like it or not, it's a part of everyday life – jump on board...?

By Rob Harris of Cutler-Hammer

WE CONTINUE TO be inundated with technology on a daily basis on several fronts. Technology that was handled by experts just a few short years ago is now readily available and in some cases, pre-installed in products for the home, the office and industry. Home computers can communicate over wireless networks, automobiles are equipped with on-board computers and electronic maps, televisions now require an engineering degree just to be able to talk to the sales associate – (well ... almost).

As companies strive to gain market share, every possible way to stay ahead of the competition is scrutinized. This includes incorporating an increasing amount of technology, be it hardware or software, into their product offerings. It arrives on a daily basis and does not appear to be slowing.

Whether we like it or not, it is becoming increasingly difficult, if not impossible, to escape the wave of technological advances that continuously flow into our daily lives.

Technology is also leaving it's mark in the fire protection industry. Some manufacturers have gone to a truly paperless office, while others have automated ordering processes that allow customers to order and track production of their purchases direct with the manufacturer. Electronic product selection programs are available that allow custom ordering procedures to be set up by dealers and distributors so that orders can be processed more efficiently and accurately.

As well as office and production systems, fire protection products themselves are being manufactured with an increasing amount of technology built in.

Fire Pump Controllers are no exception.

An increasing number of controller manufacturers are incorporating cutting edge technologies into new and existing designs. Many have been able to supply a standard or optional microprocessor based unit for quite some time. The advantages of selecting a microprocessor based unit are numerous.

Flexibility is one of the key elements of the controller. In the automation industry, programmable logic controllers brought about flexibility for installed applications. Prior to the development of the PLC, when the automotive industry required application changes on a regular basis, relay logic panels had to be completely overhauled and rewired in order to make them function properly for the new

application. PLC's drastically reduced the manpower and time required to accomplish the changes, due to the ability to reprogram the software within the unit without having to re-wire the entire control panel. Similarly, the microprocessor within a fire pump controller can have the firmware updated and modified on a regular basis, based on customer and market requirements. The built in flexibility to make these types of changes allows the manufacturer to provide a market driven solution while keeping original designs stable.

The microprocessor provides system diagnostics that are shown on a display panel that is either built in or that can be added as an option. Relay based fire pump controllers can consume a large amount of time to diagnose and troubleshoot, whereas microprocessor based units can provide instantaneous data on the system and the controller itself.

Pic courtesy of Cutler-Hammer

Messages regarding the current status and previous operation of the system can be displayed locally on the message display, printed locally or downloaded to a computer for further analysis. The ability to gather this information aids troubleshooting considerably.

Field installation personnel can provide a controller status report to the site official after completion of the installation, indicating the settings and condition the controller was left in.

Another popular feature of microprocessor based controllers is the ability to read the current status and messages without opening the front door of the unit and exposing the operator to the electrical components. Also, the message displays are increasingly able to display more information, much like the display screens showing up on automobile electronics.

TECHNOLOGY = REDUCED PUMP ROOM COSTS?

Fire pump controllers that are manufactured with printed circuit boards as a main component, or as part of an installed third party product, are also being affected by technological advances in circuit board design. In some instances, circuit boards that were traditionally populated with through-hole board level components, are being designed and manufactured with surface mount components instead. The surface mount components typically are smaller than the through-hole components, and can be mounted on both sides of the circuit boards, thus reducing board sizes. The smaller size boards are being incorporated into components that make up the fire pump controller, such as battery chargers for diesel engine controllers. This equates to a reduction in the overall fire pump controller size, which in turn, can reduce the area required for pump room installations.

TECHNICAL MATERIALS

With the advent of new technology, there can be some confusion. Some precautions should be taken to ensure that technical materials provided by the manufacturer with the product are the most current version or at the very least, easy to obtain. If software or firmware has been updated, notification of changes or upgrades should also be readily available. Knowing which version of software or firmware utilized within the product is a definite asset when communicating with the manufacturer, as this will make troubleshooting much easier.

TECHNICAL SUPPORT

Technical support provided by qualified manufacturers representatives should be easy to obtain, when required. Email has improved communication, but there's still nothing quite like having a technically trained support person available for assistance when it's really needed.

EASE OF USE

How easy the controller is to use, should always be a consideration when making an evaluation. The firmware should allow the user to interact easily with the unit. If the operating firmware is too complicated, or requires too many levels of authorization to gain access easily, the "factory expert" may be required.

COMMUNICATIONS PROTOCOLS

When it comes to developing a communication protocol, manufacturers still have a difficult choice to make. Which operating platform should the operating firmware communicate to? Industrial and commercial applications can vary greatly in the type of communication protocol that is required. Selection of the wrong one can spell disaster.

INTERNATIONAL LANGUAGES

In the global marketplace, the ability to provide products and technical information in local languages has long been a standard requirement, and is a pre-requisite to doing business in some markets. Manufacturers must have an offering that supports local needs whenever possible.

APPROVALS

Progress towards harmonisation of codes and standards has been in process for years. Manufacturers must be active within the global standards community in order to keep abreast of

Pic courtesy of Cutler-Hammer

changes and requirements that affect the production and development of new designs, as well as the upgrading of existing product offerings. Today's global supplier must be nimble enough to react quickly to changes and requirements of local and international approval agencies, whenever required. Care must be taken to ensure that customers have an understanding of the changes that are going to affect them.

TRAINING – A CORNERSTONE TO SUCCESS

Of what use is technology if it can't be used or understood? 'User Friendly' is an over used and overworked phrase, but the premise behind the phrase is solid. If technological advances are integrated into controllers, but the manufacturer does not offer training assistance, where does this leave the end user? Manufacturers must provide training for their own staff and sales force, their customers, and service providers, on a regular basis. Trainers should be of the highest calibre possible. They should be field experienced and technologically adept.

OLD DOGS VS NEW DOGS

As the population ages there will be less resistance to technology as the younger breed of customer has "grown up on it". Technology does not intimidate them, it is embraced as an everyday, natural part of life. How does the "old dog" keep up to the ongoing changes? Managing resistance to change is one of the greatest challenges facing many manufacturers today, whether internally within their organization, or externally with customers, suppliers etc. Today's manufacturer faces the challenge of keeping the product easy to understand and operate, yet technologically capable enough to perform up to today's and tomorrow's customer requirements.

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Pic courtesy of Cutler-Hammer

WHERE DO WE GO FROM HERE?

The future for technology driven Fire Pump Controllers looks promising. Controllers have already moved from having little communication available, to a point where technology has become common place. Communication from controller to computer is built-in to the microprocessors, which allow users to download pertinent system information. On-board or optional printers provide messages and alarm information that can be reviewed instantly. Floppy disk drives that allow users to retrieve system data and transport it to a computer for analysis, can be ordered as standard or as an add on option. Technical manuals can already be found in both printed and electronic format and could soon be available in a variety of storage formats. Many manufacturers have opted to provide the most up to date information in electronic formats such as CD's and on the Internet. However, unless kept up to date on a regular basis, the information runs the risk of becoming obsolete quickly.

The list of available technology driven options, whether standard or optional, is growing with each new generation of controller to enter the market place.

Where does this leave the customer in making an evaluation prior to their purchasing decision?

As with any technical purchase – be aware and be informed. Technology for the sake of technology is not the answer. These days, suppliers should be evaluated in several areas of competency – choose wisely – the old adage "Buyer beware", has never been more relevant.

MARKET LEADERS
IN MICROPROCESSOR BASED FIRE PUMP CONTROLLERS

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FDM MEDIUM VOLTAGE CONTROLLERS

Standard Features

- Components and Power Connections: Front Accessible
- Wire Connections: Reduced 50% using Component-to-Component direct connection
- Enclosures: NEMA 2, 3R, 4, 4X, 12
- Contactor: Industry leading Cutler-Hammer SL-400
- Fuses: Fatigue-Proof Current Limiting
- Isolation: No access to MV component section when powered
- Grounding: Tin Plated Copper Bus
- Operating Devices: Cutler-Hammer NEMA Rated - Oil & Dust Tight
- Space Heater: Powered from Test Circuit - Supplied as Standard

LMR ELECTRIC CONTROLLERS

LMR ELECTRIC CONTROLLERS

Standard Features

- Microprocessor Control
- Pressure, Voltage & Current Display
- Alarm & Status LED Indication
- LCD Message Retrieval – Last 2048 Messages
- Pressure Transducer - 600 PSI Max.
- Printer – Recorder
- Elapsed Time Meter
- Number of Operations Counter
- Run Period Timer
- Sequential Start Timer
- Weekly Test Timer
- Common Alarm Relay & Contacts
- Enclosures: NEMA 2, 3R, 4, 4X, 12
- NEMA Rated Contactors
- Emergency Start Operator
- Extra Set of Form-C Contacts for Phase Reversal & Phase Failure
- Additional Output Relay
- Pre-Wired Terminals for Remote Start Deluge Valve, Relief Valve Discharge
- Low Suction Pressure & Interlock

DIESEL ENGINE CONTROLLERS

DIESEL ENGINE CONTROLLERS

Standard Features

- Microprocessor Control
- Pressure, Voltage & Current Display
- Alarm & Status LED Indication
- LCD Message Retrieval – Last 1024 Messages
- Pressure Transducer – 600 PSI Max.
- Printer – Recorder
- Run Period Timer
- Sequential Start Timer
- Weekly Test Timer
- Common Alarm Relay & Contacts
- Enclosures: NEMA 2, 3R, 4, 4X, 12
- 120V or 220V Power Supply Input
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Early detection of fire:

Choosing the right technology

By Ronald B. Melucci, P.E., of RJA Group

Pic courtesy of RJA Group

THE EARLY DETECTION of fire is a key component in the life safety or fire safety plan for many types of buildings. Detectors are most commonly used to alert occupants, initiate suppression systems, or initiate control functions that enhance building fire safety. Each type of detector uses a specific technology that makes the detector inherently more effective and appropriate for certain applications.

Smoke detectors typically provide a quicker response time than do heat detectors or sprinklers, although sensitivity varies substantially by type. Smoke detectors are typically used where early warning is required to achieve the objectives of life safety, property protection or continuity of operations. UV/IR flame detectors and spark/ember detectors, also known as radiant energy sensing detectors, are also effective where early warning is required to achieve these objectives.

While there have been technological advances in smoke and fire detection in recent years, these have largely been the enhancement of detector intelligence, including drift compensation, internal self-diagnostics, and transient signal rejection algorithms. With some exceptions such as visual smoke detection, the basic principles and technology of fire detection have remained largely unchanged.

The challenges of detector selection however, are still present today as innovations in building design present unique potentials for fire hazard. The fire alarm system designer must carefully evaluate the options before specifying any detector. The following is a summary of the technology and application of the major types of smoke detectors and radiant-energy-sensing detectors.

SPOT-TYPE SMOKE DETECTORS

The defining characteristic of the spot-type smoke detector is that the smoke sensing element is a single point (a small chamber in the device) as opposed to a line (beam or cable) or a 3-dimensional (optical) field of view. There are two main types of spot type detectors, ionization and photoelectric, that respond differently to certain types of smoke. The designer should always consider the products of combustion of the anticipated fuel source(s) when selecting a spot-type smoke detector.

These detectors are mostly used in buildings of low or moderate fire hazard with standard ceiling heights i.e. office, residential, educational, etc. They are generally less effective and less serviceable in large, open/high ceiling spaces where smoke stratification may occur well below the ceiling. Spot type detectors are relatively inexpensive and are universally available and serviceable. The two types are further described here:

Ionization Smoke Detectors

Ionization detectors use a small source of ionizing radiation and electric current across two electrodes in a circuit. The air becomes conductive when it is ionized. Smoke particles attract the ions, which reduces the conductivity of the air in the chamber. The alarm activates when the current between the electrodes drops below a certain threshold level.

Ionization detectors are more effective in detecting the smaller particles of combustion that are generally found in well ventilated open flaming fires of common cellulosic materials.

Photoelectric Smoke Detectors

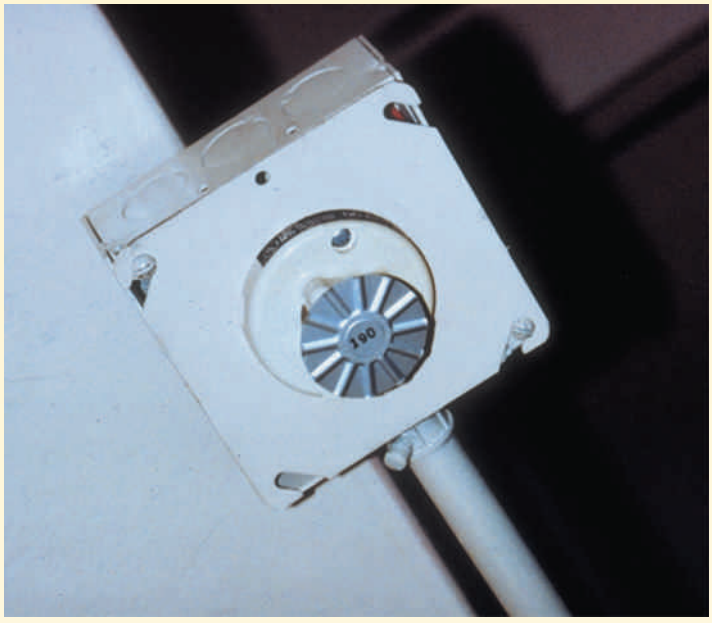
Photoelectric detectors use a light source and a light sensor. The light obscuration or scattering of light caused by the smoke is detected in the sensing chamber.

Photoelectric detectors are more effective in detecting the larger particles of combustion that are generally

found in smoldering fires, unventilated fires and fires involving some modern synthetic materials, upholstery and fabrics.

Combination Devices

Due to the limitations of each detector type, combination devices are available which employ both technologies in a single device. They are however, even more prone to false alarms from dust, steam, vapor and exhaust. There are intelligent detectors available which can distinguish these conditions from real smoke as discussed above.



Pic courtesy of RJA Group

PROJECTED BEAM DETECTOR

The projected beam detector is considered a line-type detector. It typically uses a light transmitter and receiver separated across large open space, and detects the light obscuration that occurs due to smoke. An alarm condition occurs when a predetermined threshold condition is reached. They are generally used for detection coverage in large open volumes such as atria, covered malls, auditoriums, and sports arenas.

One projected beam can cover a large area, as the detecting element is a beam of light and therefore not limited to a wall or ceiling as spot-type detectors. They are therefore useful in detecting stratified smoke below high ceilings.

These detectors must be mounted to very stable surfaces, otherwise false alarm or trouble conditions may occur. A clear line of sight is required from the transmitter to the receiver. Mirrors can be used to negotiate corners and/or to limit the number of devices to achieve the desired coverage. Mounting, aligning and maintaining the alignment of such mirrors can be quite difficult particularly where the building is prone to any type of vibration.

Reflective Beam detector

An alternate version of this technology consists of a single transceiver and a reflective prism. The light beam generated by the transmitter element is reflected by the prism back to the receiver to detect any light obscuration that occurs due to smoke.

AIR SAMPLING/SPOT TYPE LASER

This technology is available in a spot-type device, or air can be drawn in tubes through sampling ports to a remote gas analyzer. A laser light source is used in the sensing chamber. Like a photoelectric detector, the smoke chamber detects reflected laser light from smoke particles in air. Using intense focused laser light results in more light scattered in the sensing chamber, making this technology extremely sensitive. Invisible products of combustion can be detected before a flaming fire starts.

Due to the high sensitivity, the technology is affected by the slightest contamination of air. Typical applications include very clean environments telecommunications facilities, semiconductor fabrication rooms, computer rooms and other areas where a small amount of smoke or downtime can cause substantial monetary loss.

The air-sampling version of this technology is less sensitive due to the effects of dilution. Dilution occurs is when smoke is drawn into one sampling port and clean air is drawn into the other sampling ports. The net effect is a lower concentration of smoke at the detection point of an aspirated system. The network of air sampling tubes does not contain electronics to allow monitoring in a point-addressable configuration. This technology therefore may not be appropriate where knowledge of the precise fire location is a fire safety or life safety objective.

RADIANT ENERGY-SENSING FIRE DETECTORS

Radiant Energy-Sensing Fire Detectors are optical devices that detect radiant energy (such as ultraviolet, visible, or infrared) such as is emitted from flame, sparks and embers. Radiant Energy-Sensing Fire Detectors include Ultraviolet (UV) flame detectors, Infared (IR) flame detectors and spark/ember detectors.

The UV/IR detectors typically have a 60 to 90 degree cone of vision, with the highest (100 percent) sensitivity lying along the central axis. The sensitivity drops off to zero percent at the perimeter of the field of view.

These detectors are predominantly used in high hazard and/or high cost applications such as military aircraft hangars, fuel stations, printing machines, engine rooms and hazardous material storage. These detectors are very effective when used in the correct application. System design however, requires a level of precision and attention to detail beyond what is not generally required with other types of systems. The detector must be matched to the specific radiation signature of the fire or spark/ember to be detected. The designer should be confident that the end use is such that the line of sight between the detector and the protected area will be maintained free of physical obstructions. Potential ignition sources and fire hazard(s) must be within the field of view and the detection range of the device. In selecting an appropriate radiant energy-sensing fire detector, the designer must also consider the following, as summarized in NFPA 72 – *The National Fire Alarm Code*:

- Size of spark or fire to be detected
- Type of fuel involved
- Detector sensitivity
- Field of view
- Distance between fuel and detector
- Radiant energy absorption of atmosphere
- Extraneous sources of radiation
- Design objective(s)

Although microprocessors and detection algorithms are incorporated into most devices to mitigate the potential for unwanted alarms, these detectors can still be adversely affected by radiation sources such as sunlight, lightning, x-rays and hot objects. Specific design considerations for each detector type are described here:

Ultraviolet (UV) Flame Detector

Smoke from a fire absorbs UV radiation. Design precautions must be taken if accumulations of dense smoke can be expected to precede the presence of a flame. UV absorbing gases or vapors must not be allowed to accumulate between the detector and the protected hazard. The detector will also detect sources of UV besides fire, such as lightning, arc welding, high voltage corona, x-rays and gamma radiation.

Gasses and vapors that exhibit significant UV absorption characteristics can reduce the effectiveness of the detector. Among these are acetone, naphthalene, ammonia, benzene and toluene. These gases and vapors can restrict UV detection if they are in the atmosphere in heavy concentrations.

Infared (IR) Flame Detector

The response is limited to carbonaceous fuels. It should not be used to detect fires from fuels that do not contain carbon, such as hydrogen, sulfur and burning metals. Dense fog, rain as well as certain gases and vapors can absorb IR radiation and reduce the sensitivity of the detector.

The infared radiation emitted from an object is proportional to the object's temperature and view factor (size, distance and orientation). Spurious/nuisance alarms may result when IR radiation sources exhibit a sufficient amplitude and flicker "signature", such as vibrating hot objects. Many are designed to ignore steady state infrared sources that do not have a "flicker" frequency characteristic of a fire.

UV/IR flame detector

The UV/IR flame detector senses energy in the short wave section of both the ultraviolet and infrared portions of the electromagnetic spectrum. These combination devices require detection of matching radiant energy signatures in both the UV and IR sensors to trigger an alarm signal. This results in a detector that is more false alarm resistant than either UV or IR alone, but is subject to the aforementioned limitations of both technologies. Designers should note that specifying a combination device may not always be an effective "shotgun" approach to protecting the area in question.

The principle of operation of visual smoke detection is based on computer analysis of video image from a CCTV camera field of view. The system therefore does not rely on the proximity of smoke to a detection element.

Spark/Ember Detector

A radiant energy fire detectors designed to detect sparks, embers, or both are known as Spark/Ember Detectors. These devices are normally intended to operate in dark environments such as air ducts or other closed conveyer systems.

These detectors are oriented perpendicular to a duct or conveyor to look "across" the duct, not "down" the duct. They are generally used to initiate an appropriate response from a suppression system to prevent a larger fire or explosion. Although similar in principle, the radiant emissions from a spark or ember are very different from that of a flame.

VISUAL SMOKE DETECTION

This is a relatively new smoke detection technology that has been used internationally, and has received approvals from Factory Mutual and is currently being used by the nuclear power industry. NFPA 72 committees are currently in the process of incorporating visual smoke detection into the National Fire Alarm Code.

The principle of operation of visual smoke detection is based on computer analysis of video image from a CCTV camera field of view. The system therefore does not rely on the proximity of smoke to a detection element. The image processing technology allows early detection of small amounts of smoke in a cavernous environment, such as a turbine hall. Video images are monitored frame-by-frame for small image changes at the digitization stage and passes these pixel changes to the main processor to search for certain smoke "signature" characteristics.

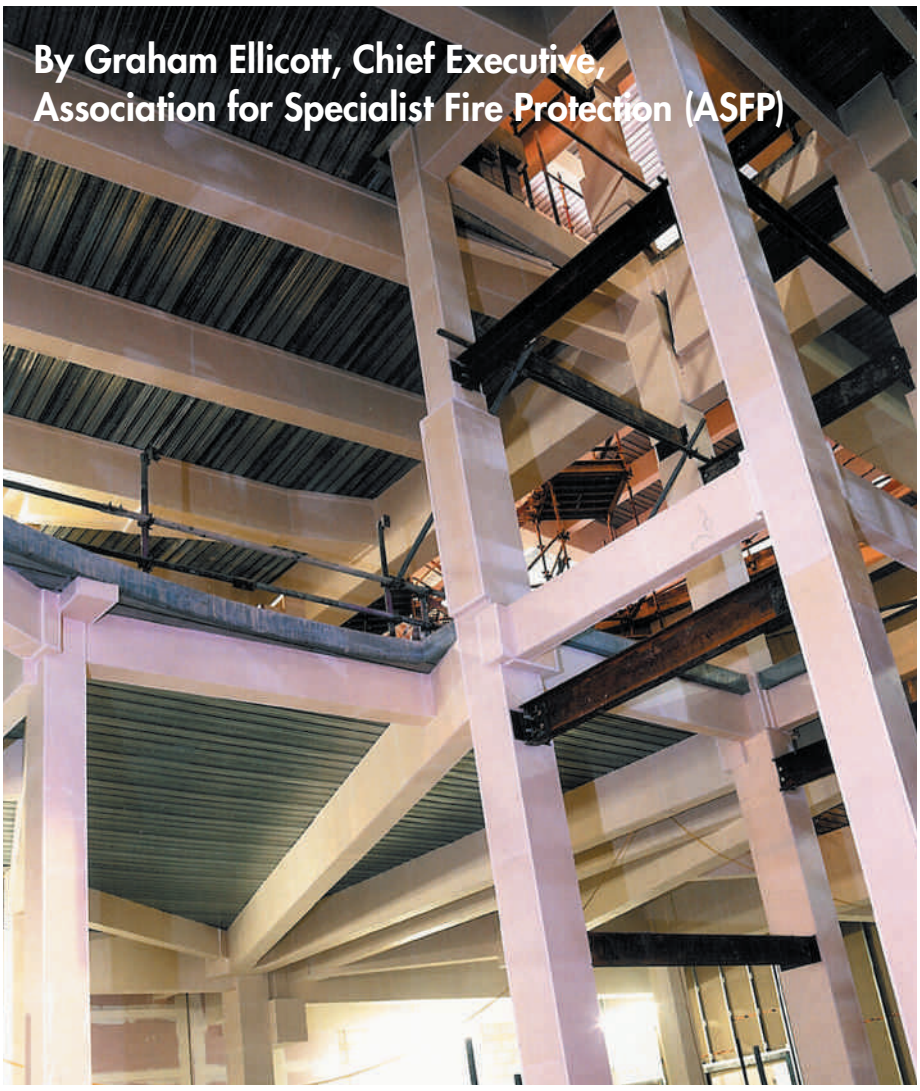
Existing standard CCTV surveillance cameras can be used. They can be fitted into protective or intrinsically safe housings, or can look through glass windows, to detect fires in hazardous areas such as radioactive, explosive, corrosive and extreme weather/temperature environments. The software can also be modified to account for the presence of ambient smoke. This can also be achieved by eliminating or masking parts of the image from detection on an individual pixel-by-pixel basis. Typical applications include power stations, warehouses, offshore oil & gas installations and tunnels.

As stated above, visual smoke detection is not currently addressed in the National Fire Alarm Code. All of the design considerations and limitations are therefore not as of yet well documented.

Smoke and fire detectors have had a profound effect on the reduction in fire deaths and fire losses. Their misapplication can result in unwanted alarms or reduced effectiveness. A fire protection engineer experienced in the design of fire alarm systems should be consulted when the designer is not experienced with these considerations.

Extra fire protection –

By Graham Ellicott, Chief Executive, Association for Specialist Fire Protection (ASFP)



IN THE LAST EDITION of 'International Fire Protection' we discussed the efforts that are needed to stay out of jail by carrying out effective risk assessments on the buildings with which you are involved. The link between risk assessments and the view of insurers was also explored (to some extent) with the possibility of reduced premiums whilst retaining the appropriate level of insurance cover.

Over the last months there has been an increase in the level of interest from the insurers with regard to fire protection in buildings. This is evidenced, in part, by the work of the InFiRes group of the Fire Protection Association (FPA), which contains the leading insurers plus senior FPA personnel. InFiRes has several working parties and one of them is looking, in particular, at passive fire protection in the UK's buildings. In addition, the 2000 edition of the Loss Prevention Council's (LPC) Design Guide for the Fire Protection of Buildings has been made available as a free download from the InFiRes section of the Fire Protection Association's website (www.thefpa.co.uk) and this should be accessed by individuals interested in the passive fire protection of the UK's buildings. It is an invaluable source of information for those who wish to design their buildings to a higher standard than is required by the Building Regulations.

The principle objective of this document is:

'To provide those most closely concerned with the design and construction of industrial and commercial buildings with expert guidance and information which will enable them to plan and build premises which are inherently safer from the fire hazard'.

Buildings designed using the parameters of the guide will cope better in the event of fire. Any fire that does break out:

'will probably be confined to one compartment of the building, because of the Guide's provisions on compartmentation' and will *'result in less damage from flames and smoke'.*

The LPC Design Guide is currently being updated and is being issued in modular form. The first module dealing with 'Essential Principles' is also now on the FPA website and there is a facility for those that are interested to register for notification of the issue of the subsequent modules. If you are involved with the safety of a building and its occupants then you should be interested!

The extra interest from the insurers is certainly to be welcomed and all building owners would be well advised to discuss their fire protection with their insurance company. Failure to do so may mean that the building owner in question not be well forewarned if the insurer decides to remove cover from your building because of the lack of evidence of risk assessments, or because the fire protection is not, in his opinion, sufficient for the building(s) in question.

The rationale of the Building Regulations in the UK is that "in an

an academic exercise?

emergency the occupants of any part of a building should be able to escape safely without any external assistance" (Approved Document B to the Building Regulations, 2000 Edition). However in many cases the designer of buildings/structures, or the owner of an existing building may want to go further and increase the level of passive fire protection, so as to give the fire services more time to extinguish the fire before the building collapses. In the event of a fire this could lead to a reduction in the amount of damage caused and thus, in the consequent insurance claim! Addition fire protection will also provide extra comfort to insurers and also the fire-fighters who may have to enter a fire-ravaged building after the occupants have escaped.

Extra fire protection is not just beneficial to the building's owners, insurers and to the fire-fighters; it can also be of major benefit to the local community. In the case of a fire say in a school, which wipes out most of the structure, the effect on the children's education is immeasurable. They may need to be split up to continue their studies and if course work for public exams is destroyed this could mean that the pupils will have to repeat a year. Often schools are a focus in the community; the school gate is where many parents have their only point of adult-to-adult contact during the day. And, in addition to providing education to children, many schools nowadays provide a provision for mothers and toddlers, disabled and the elderly. These groups may also have their lives disrupted.

The compartmented structure provides demarcated lines of safety for fire-fighters and occupants. The allowable size of a compartment will vary with the height and use of a building, the fire load contained in the building and the ability of fire-fighters to intervene effectively.

The Arson Prevention Bureau, a national organisation representing insurers, police and fire services, estimates that fires in schools costs the UK £100 million each year with an average of 20 schools suffering a major fire every week. The current level of fires in schools is 17% up on previous years.

For schools, extra passive fire protection is likely to mean that particular attention should be paid to containing any fire within the compartment in which it started. Compartment walls and floors are specifically intended to ensure that fire is not allowed to spread horizontally or vertically through a building.

Extra fire protection is not just beneficial to the building's owners, insurers and to the fire-fighters; it can also be of major benefit to the local community. In the case of a fire say in a school, which wipes out most of the structure, the effect on the children's education is immeasurable.

The compartmented structure provides demarcated lines of safety for fire-fighters and occupants. The allowable size of a compartment will vary with the height and use of a building, the fire load contained in the building and the ability of fire-fighters to intervene effectively. Any compartment wall below a service void should run continuously up through the void to prevent the spread of fire through it. Where the void is in a roof, the wall should reach roof level, or pass through the roof to a specified height to prevent spread of fire across the roof. The junctions of compartment walls or floors with each other, with external walls, or roofs, must provide continuity of the expected fire-resisting performance.

Any element (including structural) passing through compartment walls or floors should have associated fire-stopping at the point of penetration and the aperture should be kept as small as practicable. The design should ensure that the failure of a penetrating structure, because of fire in one compartment, will not cause failure in the adjacent compartment. The same comment applies to the passage of building services and special provisions are required for protected shafts.

But where should the designer look for the type of information that will allow him or her to add in the extra level of passive fire protection to

Extra fire protection – an academic exercise?

benefit the fire-fighters and to preserve the building for a longer period of time? Well, we're back to the FPA and the LPC's 'Design Guide for the Fire Protection of Buildings'.

How much extra passive fire protection does the LPC Design Guide ask for in comparison to Approved Document B of the Building Regulations? This varies by the type of building but for schools, for example, the guide recommends that compartment walls have 120 minutes fire resistance, while Approved Document B recommends minimum periods of 30, 60, 90 and 120 minutes, depending upon its location in the building. The Design Guide also suggests in (some cases) more restrictions on the size of a building's compartments than does Approved Document B.

At the end of the relevant phase of construction, the passive fire protection installer will issue a Certificate of Conformity, which will claim that the product has been installed in accordance with the terms of the contract.

It's all very well specifying an increased level of passive fire protection for a building, but it is equally necessary to ensure that the systems are properly installed and maintained. At the end of the relevant phase of construction, the passive fire protection installer will issue a Certificate of Conformity, which will claim that the product has been installed in accordance with the terms of the contract.

But what does the Certificate of Conformity mean? Is it worth the paper it's written upon? In the ASFP's view, its worth is greatly enhanced if it is issued under the auspices of a third party accreditation scheme. Such schemes mean that competent operatives have correctly installed the specified products and that independent inspectors have randomly inspected the work. Third party accreditation schemes were implemented to improve the quality of the UK's passive fire protection. Approved Document B of the Building Regulations states that 'Since the fire performance of a product, component or structure is dependent upon satisfactory site installation and maintenance, independent schemes of certification and registration of installers will provide confidence in the appropriate standard of workmanship being provided'.

The ASFP believes that designers and building owners should consider the use of more passive fire protection in buildings that are critical to the community, such as schools and hospitals etc. Extra passive fire protection is not just an academic exercise. It could mean the difference between a building, that is important to the community (such as a school) surviving in the event of a fire. The value to the community of keeping these buildings operational far outweighs the small additional cost of an extra level of passive fire protection.

The ASFP believes that designers and building owners should consider the use of more passive fire protection in buildings that are critical to the community, such as schools and hospitals etc. Extra passive fire protection is not just an academic exercise.

In most cases, the knock on effects for the community should a building not survive, would be many-fold the cost of replacing the building itself. The only people that might imaginably benefit from this are those less motivated pupils who would get some extra time off!

PURAFOAM PROVIDES PURER ANSWER IN FIGHTING FIRES

Leading fire specialist **Chubb Fire** has launched purafoam, a new foam extinguisher that combines the best fire fighting capabilities with an enhanced environmental performance to redefine the current fire extinguisher market.

"A show-stopping issue in developing extinguishers with 'environmentally friendly' qualities has been maintaining their fire fighting effectiveness," explains John Spencer, Chubb Fire's Managing Director. "The general consensus has been that a product's ability to put out a fire has been more important than its after-effects on the environment. Following a global search, we have developed purafoam and we have not had to compromise on biodegradability or performance. Not only is it significantly more friendly to the environment, but it is also arguably the best extinguisher currently available for fighting Class A (solids) and Class B (liquids) fires."

With the launch, Chubb Fire welcomes DEFRA's new rules on 'green' product labelling, but is calling for greater clarity in defining the environmental qualities of extinguishers, since in the UK no such definition or testing currently exists. John advises "Businesses should always specify third party approvals when buying fire extinguishers. We had to look overseas for a standard to test purafoam against, as we are committed to proving our claims that purafoam is a more biodegradable product". Purafoam meets the stringent Dutch Stichting Milieukeur test (derived from the European Groundwater Directive) for biodegradability (see notes to editors). "In simple terms" John continues, "this means that purafoam will break down much more easily in the environment when it is discharged than traditional AFFFs.

"Most foams contain fluorosurfactants – a known organohalogen which although banned under the European Groundwater Regulations, are so effective in smothering liquid fires and preventing re-ignition that this has taken priority over any potential environmental considerations. Of course we would like one day to design a product that is totally environmentally safe, but never at the expense of its fire fighting effectiveness.

"For the moment purafoam represents a significant step forward that we hope will be received well by both customers and environmental lobbying groups alike.?

From January 2004, Chubb will be supplying Stichting Milieukeur-approved extinguishers. Customers will be given the choice between purafoam extinguisher or standard AFFF extinguishers."

For more information please contact:
Chubb
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In large areas with potentially explosive atmospheres, protection against smoking fires can be provided by a beam detector from **Fire Fighting Enterprises.** Fireray Ex comprises an infrared transmitter and a receiver, both of which are ATEX-certified for use in hazardous areas, as well as a separate wall-mounted controller to allow adjustment and testing from a convenient non-hazardous location.

Fireray Ex is designed for large enclosures within oil rigs, refineries, aircraft hangars, ordnance stores and similar premises. It provides an early warning of smouldering or strongly smoke-generative fires, some of which may not be picked up by the flame detectors installed in many hazardous areas.

A modulated infrared beam is sent from the transmitter to the receiver, which generates an alarm if the beam is obscured by smoke. With the two components installed up to 100 metres apart, a single detector set can cover an area of up to 1500 m^2. To protect the same area with self-contained "point" smoke detectors would prove significantly more expensive: around 15 special intrinsically safe devices would be needed, greatly increasing both hardware and cabling costs.

Like FFE's other Fireray beam detectors, the explosion-proof version has a drift compensation feature. This ensures that a gradual reduction in signal strength, caused either by the accumulation of dust on the housing or by slight movement of the building, will not result in an unwanted alarm.

Suitable for supply voltages from 12 to 24 V DC, Fireray Ex has a low current consumption, making it easy to integrate into existing detection and alarm systems. In its quiescent state, the controller draws 8 mA at 24 V DC, while the transmitter draws 5 mA at 24 V DC. The receiver is powered by the controller.

For more information please contact:
Fire Fighting Enterprises Limited
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Valves. The valves, designed and manufactured by **LPG** are very flexible and adaptable to the whole range of release systems used in the market, allowing even the combination of several types of release systems.

At the moment **LPG** is one of the few manufacturers having their systems and components certified by the most credited entities and independent laboratories, such as **UL** (the United States), **VDS** (Germany), **LPCB** (England), **CNPP** (France), **VNIIPO** (Russia), **APCI** (Cuba).

For more information please contact:
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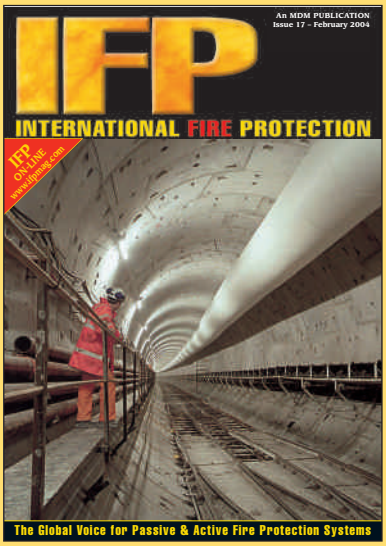

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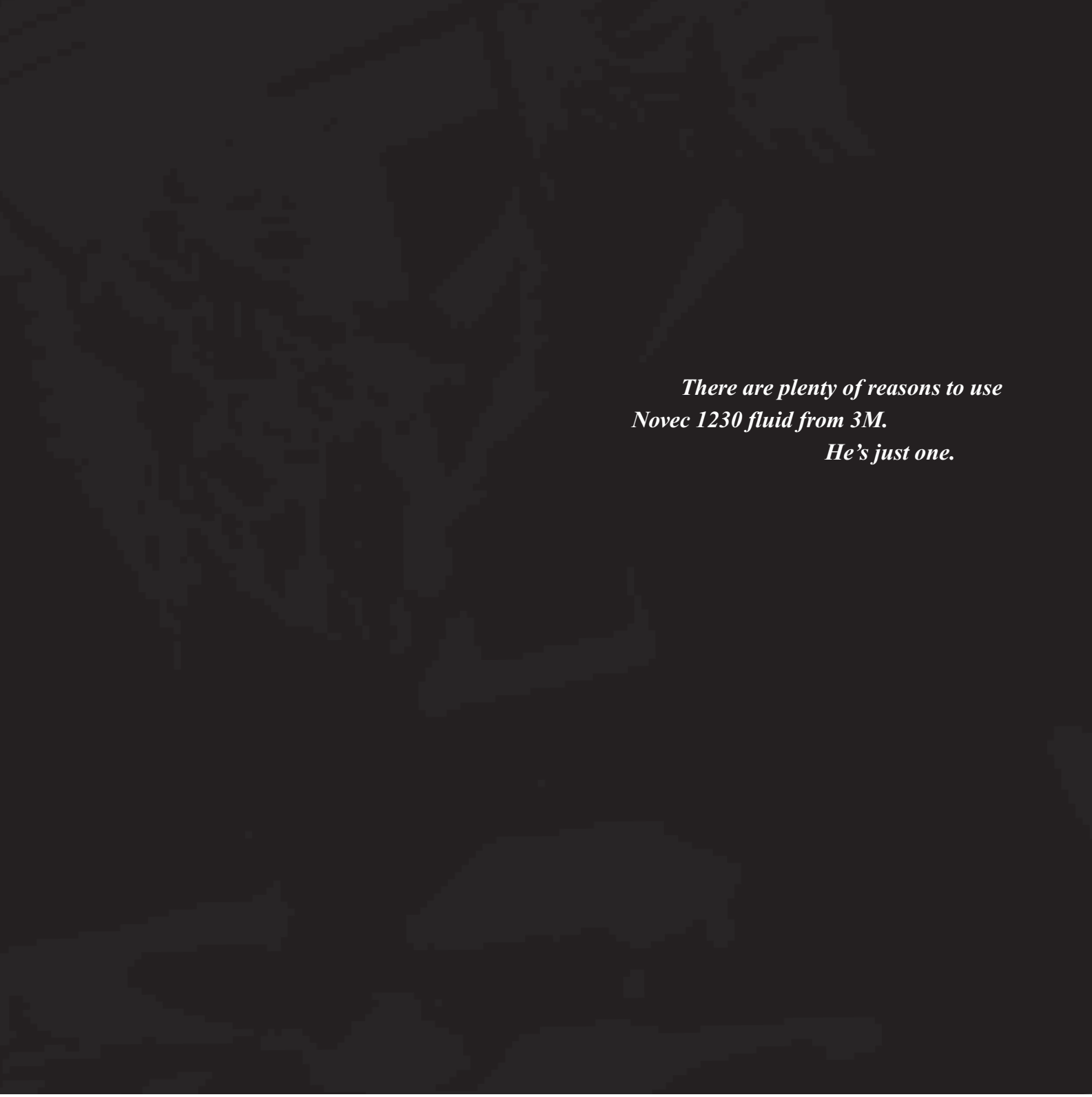

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IFP

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TWO PIONEERS. ONE FOAM.

Dwight lives in the South, Mitch to the North. Dwight circles the globe battling fires that engulf fuel storage tanks and oil fields. Mitch travels too, but mainly to visit laboratories and test facilities.
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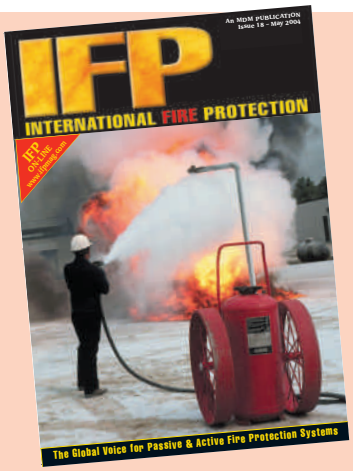

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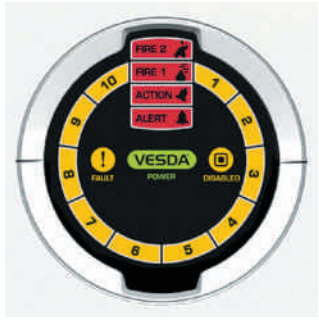

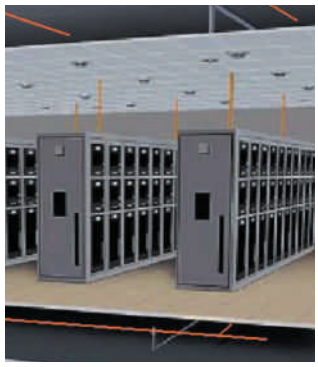

CONTROL LOGIC Spark detector

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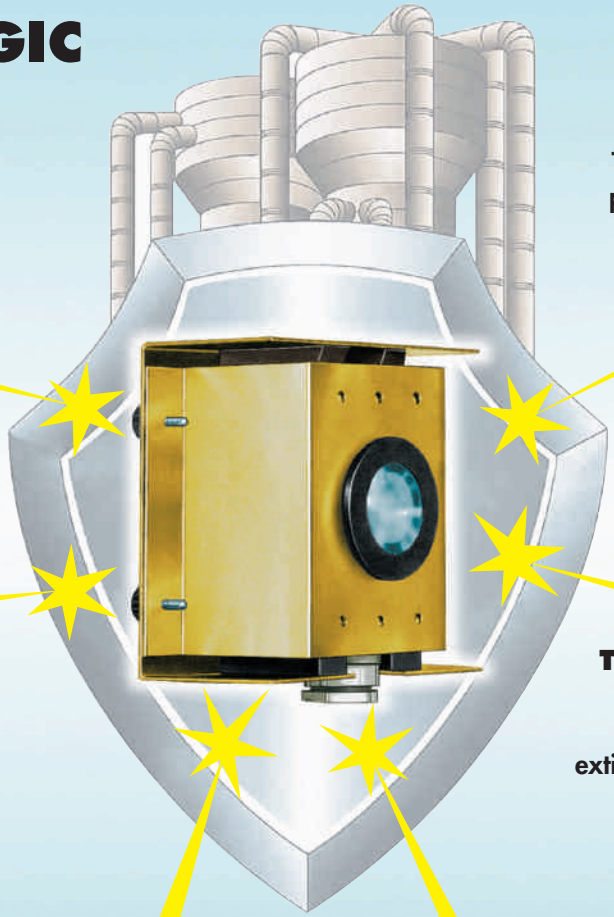

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Passive Fire Protection on LPG Storage Tanks

By Diego Penta

George Patenaude stands proudly next to an LPG tank fireproofed with Fendolite M-II by his company, W.W. Patenaude Sons, Inc.

Why active systems are inadequate, and what you can do to ensure Pre-Fire Durability of the passive fireproofing system

NEW STUDIES REVEAL that deluge systems installed on liquefied petroleum gas (LPG) tanks do not perform as well as they should in fires. Deluge water systems are designed to completely immerse a structure on fire with a steady stream of cooling water. To work properly, they must quickly flood the tank's outer shell and keep the entire surface wet until fire brigades can arrive to extinguish the flames. Any areas left dry during these precious few minutes will be susceptible to melting and rupture, as outside temperatures can climb to 2,000°F in just 5 minutes. According to numerous reports, deluge water systems tend to leave many tanks with dry spots, and in some cases they do not activate at all.

Unfortunately such findings are not limited to the industrial market: the National Fire Protection Association (NFPA) collected similar data in a 2001 study which found that sprinklers in office buildings fail to operate approximately 16 percent of the time.

This is disturbing news. LPG tanks typically contain liquefied propane, butane, or a combination of both. If a tank shell ruptures, the liquid will immediately vaporize into a cloud several hundred times the volume of the tank. This vapor cloud can self-ignite into what is called a BLEVE (boiling liquid expanding vapor explosion). Some of the world's worst refinery accidents started as small fires that eventually led to LPG tank shell rupture and BLEVE's. Mexico City's 1984 PEMEX disaster is perhaps the most infamous of these occurrences: 500 workers lost their lives and the entire terminal was destroyed in less than two hours as LPG tanks exploded one after the other in a catastrophic domino effect.

BLEVE's, widely considered to be the worst-case scenarios for oil refineries and petrochemical plants, must be avoided at all costs. It is for this reason that LPG tanks require more fire protection measures than any other steel structure. According to the American Petroleum Institute's (API's) published standards, "Fireproofing used in combination with water-application systems will provide fire protection until the water system is activated. It will also function as a temporary backup in case the water supply is interrupted or the water-application rate is inadequate." Exceptional and *reliable* fire protection systems must therefore be implemented and maintained on and near LPG tanks to safeguard surrounding equipment and worker's lives in the unfortunate event of fire or terrorist attack.

Passive fire protection, in the form of insulative coatings, can be applied directly to LPG tank shells. Where active systems may fail, passive systems will reliably keep the tank shell cool in a fire for hours on end. George A. Patenaude, president of W.W. Patenaude Sons Inc., has been applying such fire protective coatings for over 40 years. Working as subcontractor to Jett Industries of Colliersville, NY, he fireproofed large propane tanks in Upstate New York with a unique cementitious fire protection product called Fendolite® M-II. Manufactured by Isolatek International in Stanhope, NJ, Fendolite M-II is both an insulative and energy absorbing material based on Portland cement and vermiculite. It is designed to adhere to steel even during rapid-rise fires, without decomposing, and to absorb heat energy via the release of steam. A cured thickness of 2¼" of Fendolite M-II can keep an LPG tank from reaching critical temperatures in a hydrocarbon fire scenario (a fire that reaches 2,000°F in the first 5 minutes) for up to 4 hours.

Once installed, a passive fire protection system will (hopefully) spend much or all

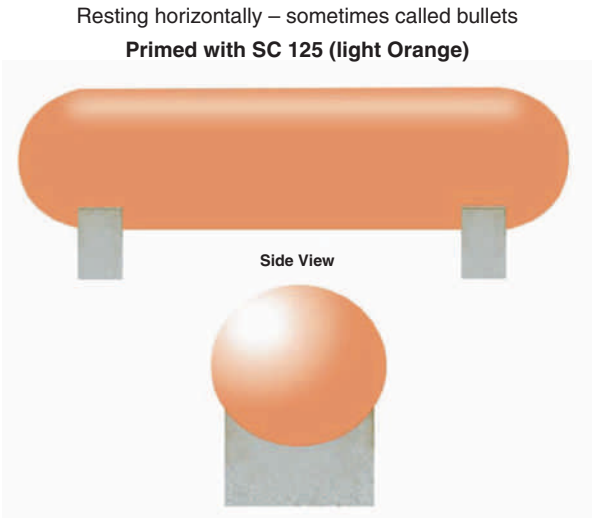


Figure 1

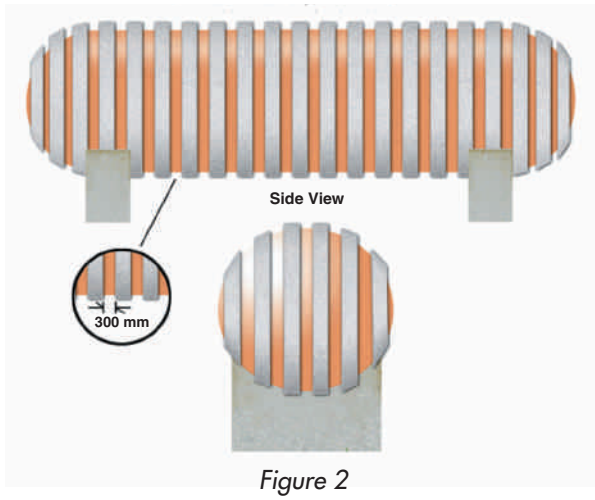


Figure 2

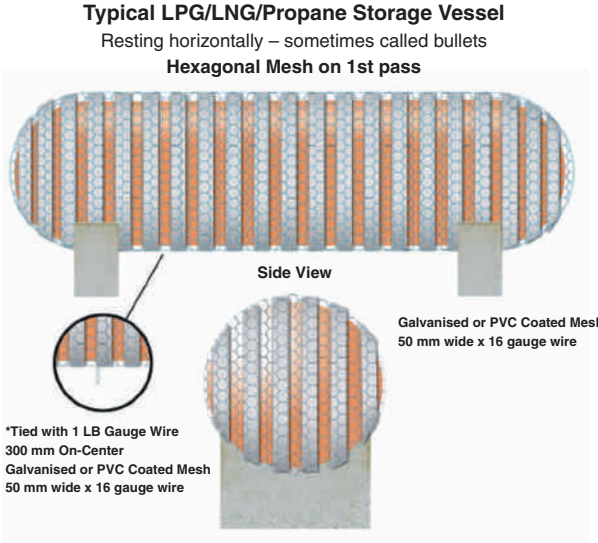


Figure 3

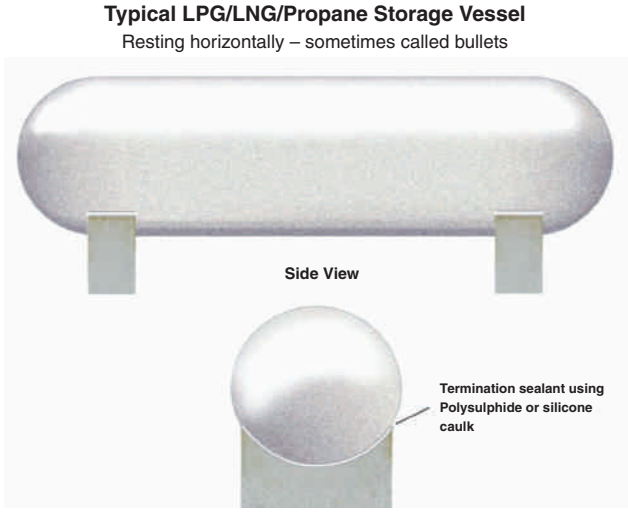


Figure 4

Figures 1-4: The "Collar and Band" method of applying cement-based fireproofing onto a horizontal LPG Storage Tank. Figure 1 (top left) shows the application of a primer to prevent corrosion. Figure 2 (top right) shows the first application of the fireproofing as 2-ft wide collars surrounding the tank at 3-ft intervals. These collars are then used to float a layer of 2"x2" mesh off the surface of the tank, as shown in Figure 3 (bottom left). By wrapping the flexible mesh around the tank and fastening it to itself with tie-wire, the metal of the mesh is never in contact with the surface of the tank, preventing localized electric potential which could result in rust and possible delamination. The final passes of fireproofing can then be sprayed through the 2" or 3" openings of the mesh, as shown in Figure 4 (bottom right).

of its life in an inert state. Ideally, it must not lose any of its potency. However, throughout this period it will inevitably undergo natural ageing, and have to endure various aspects of use and abuse. This concept, known as "Pre-Fire Durability", is especially important when coating LPG storage tanks, which can swell and shrink by as much as 5% upon filling and venting due to changing internal pressure. This constant volumetric change over time can wreak havoc on a tank's coating, so it presents a unique challenge to the fireproofing contractor.

Mechanical reinforcement, such as hexagonal mesh or diamond lath, is an integral part of the fire protection system in that it promotes pre-fire durability. It adds flexural resistance and improves adhesion of the fireproofing system.

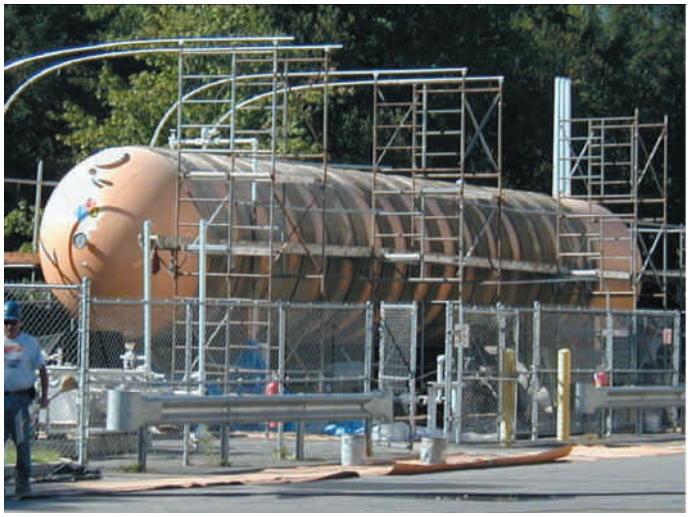
However, LPG tanks present more of a challenge to the contractor than a typical piperack or vessel skirt. "You cannot weld or fasten reinforcing pins to the surface of an LPG tank," Patenaude warns. "And simply wrapping the tank with lath is not a good design. If the lath isn't embedded in the middle third of the fireproofing, flexural resistance cannot be achieved. It also leaves a void at the bottom of the tank where water is allowed to accumulate. This promotes rust."

Bijou Ganguly, director of Isolatek's Industrial Division, takes the argument one step further. "If installed improperly, the fireproofing system will not adhere to the tank. Past investigations have proven that adhesion failure occurs in areas where the metallic mesh touches the shell of the tank. To ensure pre-fire durability, any direct metal-to-metal contact within the product is strictly prohibited."

Faced with the dilemma of applying reinforcement without attaching it to the steel, Patenaude consulted with Isolatek on how to solve the problem. They engineered a revolutionary method of application known as the "collar and band" method, which is illustrated in **Figures 1–4.**

The first coat of fireproofing is applied

An anti-corrosion primer ensures good adhesion of the first coat of fireproofing, enhancing Pre-Fire Durability of the fireproofing system.



First pass of fireproofing is applied as 24″ wide "collars".

in a series of collars about two feet wide and spaced three feet apart. The mesh is then placed over the first coat and tied in place, effectively "floating" it off the surface of the tank. Because the mesh has such wide openings, the second coat of fireproofing can be sprayed directly through the mesh, filling in the three-foot wide gaps. A third coat is then applied to reach final thickness.

The end result is a uniform layer of fireproofing with mesh reinforcement suspended within the matrix. The mesh and the tank shell, although of dissimilar material, are never in contact with each other, preventing corrosion. The fireproofing system now has Pre-Fire Durability, fortifying the fireproofing system so it can withstand years of service.

These photographs detail Patenaude's employment of the collar-and-band method in upstate New York. The orange coating shown in the first photograph is a primer coat specifically designed to prevent corrosion at the substrate by decreasing electric potential between the steel surface and the galvanized mesh. For this project, Patenaude chose a primer with excellent adhesion properties to the cement-based fireproofing.

Patenaude then applied the first coat of fireproofing in a series of collars enveloping the circumference of the horizontal tank, as detailed in **Figure 2** and in the middle photograph at left. Following established industry practice, he intentionally left this pass with a rough texture, as the first coat is not only responsible for holding the mesh completely off the surface of the tank, but it also must lend a good key for the second and third coats.

The mesh can then be applied after the first coat is allowed to set for 24 hours. To allow spray material through to the surface, the openings of the mesh must be at least 2″ wide. Patenaude used 2″ x 2″ diamond mesh. The sheets of mesh were unrolled over the top of the tank and secured in place with stainless steel tie-wires at regular intervals along the perimeter of the tank (see **Figure 3** and bottom photograph).

With the mesh taut across the surface of the first coat and held 1¼″ off the surface of the tank shell, Patenaude continued spraying the remainder of fireproofing onto the tank. Conveyed directly through the 2″ openings of the mesh, the fireproofing filled the open gaps between the bands, just up to the level of the mesh.

At 1¼″ thick, the second coat was allowed to dry overnight before application of the third coat.

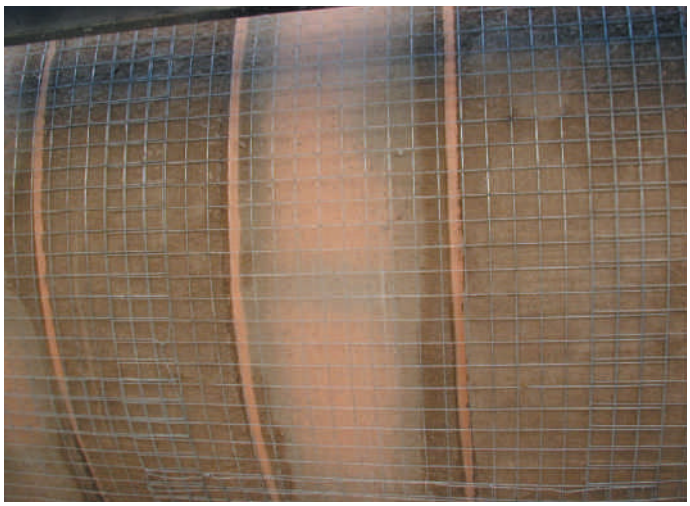
"The fireproofing material was very user-friendly and easy to apply," commended Patenaude.

The application took place in September of 2002. In Upstate New York, even autumn temperatures can sometimes go below freezing. As the fall wore on, Patenaude employed the use of insulating blankets to offset the colder night temperatures.

"If the temperature falls below freezing during application," says Ganguly, "then the water in the fireproofing will expand as it freezes. Minor repairs might be required before proceeding with the rest of the application. "

"That's typical when applying cementitious materials, whether you're in plastering, construction, or fireproofing," says Patenaude. "The trick is to keep the temperature above freezing, even during cold winter months."

Mesh is "floated" off the tank shell surface on the bed of fireproofing collars.



The 2″ openings of the mesh are wide enough for subsequent coats of fireproofing to be sprayed through, filling the gaps.

Application of final coat of fireproofing. Each coat requires 24 hours to dry before application of subsequent coats. The final coat must dry 7 to 10 days before application of a topcoat and termination sealing.

Cementitious products will not cure properly if water within the matrix is allowed to freeze. Patenaude employed the use of a heated enclosure to battle the colder days on the job.

"We erected a complete heated enclosure for the third tank," he says. "This proved to be a very efficient way to counter marginal weather and colder nights."

A final inch of material above the mesh was applied to the tanks in the last coat, bringing the full thickness of fireproofing to two and a quarter inches. According to the GASAFE method of protecting LPG tanks, this thickness provides a 4-hour fire rating. To a firefighter, that four hours is critical. Without a fireproofing system in place, an LPG tank can suffer complete failure in less than 15 minutes.

With the fire protection barrier in place, there remained one final step. To fight water ingress from rainfall and corrosion from chemical attack (typical pH reading in an oil refinery falls in the 5.0–6.0 range), Patenaude sealed the fireproofing with a white top coat. Highly compatible with cement-based products, the top coat is used to provide enhanced weather protection for outdoor applications of cementitious fireproofing.

However, Patenaude did not apply the top coat until the following year. As a lasting testament to this method of applying cement-based fireproofing, even after the harsh winter of 2003, only minor repairs were required prior to the application of the top coat.

"Because we were using a proper anti-corrosion primer, a final top coat, and because we successfully floated the mesh in the middle of the fireproofing, the tank is well protected from corrosion, water ingress, and volumetric change," says Patenaude. "We took every step to ensure pre-fire durability of the entire system."

The added safety and peace of mind provided by passive fireproofing systems are immeasurable. LPG storage tanks, if damaged by a localized fire that goes unchecked by an inactive deluge system, can do more damage to the installation than the actual fire itself should the tank shells reach critical failure. In a fire fueled by petroleum hydrocarbons, that failure can occur in as little as 15 minutes. If plant owners and engineers are more vigilant in specifying a combination of both passive and active measures, further tragedies like the Mexico PEMEX disaster can be avoided?

W.W. Patenaude Sons, Inc., founded in 1930, specializes in high performance coating installations for chemical, manufacturing, water treatment, and power generation industry. They have a forty-year history in fireproofing applications for industrial structures, tanks and equipment. They are a union contractor – all persons involved on this project were members of district council #9 brotherhood of painters and allied trades.

Photos courtesy of W. W. Patenaude Sons, Inc.

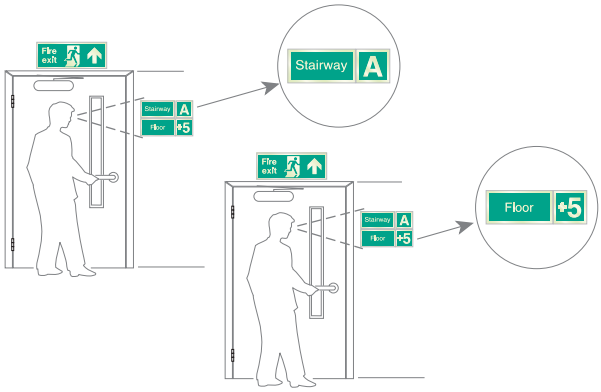
As originally published in *Industrial Fire World*, May/June issue, 2004

The finished propane tank, protected with fireproofing for a 4-hour hydrocarbon rating.

The completed tank now has a combination of both passive and active fire protection measures.

STAIRWAYS ARE UNFAMILIAR ENVIRONMENTS IN HIGH RISE BUILDINGS ACCORDING TO RISK ASSESSOR

Post September 11th and formal risk assessments have proved that escape stairways are an unfamiliar territory for evacuees. It is important when planning a means of escape route system to take into account stairways that lead to other floors or transfer corridors giving access to separate buildings.



Evacuees using unfamiliar escape stairways need total confidence in their location and which floor they are on at any point of time during an evacuation. It is vitally important therefore, that these stairways are clearly identifiable even in complete darkness and that each floor access is clearly numbered.

JALITE have designed a concise and methodical photoluminescent identification system that will ensure evacuees are more confident during an evacuation process and the speed of egress will be improved. It will also assist key fire personnel with their evacuation plans, enabling them to quickly locate and identify any potential risk to staff and visitors contained within a particular area in an emergency evacuation.

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RISK ASSESSMENT AND SMALL BUSINESSES – WHAT'S THE SOLUTION?

From discussion and comments received, the problem most identified was "how do I start?". Means of Escape believe that the starting point is the Fire Safety Audit. This information, when documented, will form the basis of the decision process and the process of continuous improvement and covers some of the following subjects:

- ✓ Why you should be concerned about fire safety
- ✓ The points to cover concerning fire precautions
- ✓ Training and education
- ✓ What the risk assessment process is
- ✓ The difference between a hazard and a risk
- ✓ How to carry out the risk assessment process
- ✓ The causes of fire and reducing sources of ignition
- ✓ What if a fire occurs
- ✓ Employees with disabilities or special needs

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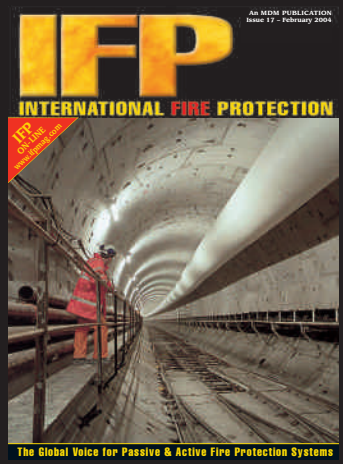

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Emergency Exit

by Jim Creak

A review of the international standards governing safety signs and wayguidance systems

Pic courtesy of JALITE plc

A PERSON WHO HAS TO DECIDE how to get out of a burning building is likely to be under significant psychological and even physical stress. Successful evacuation is partly dependent on physical values such as distance, proportions of exits and density of smoke and partly on psychological values, such as communication processes, perception, conceptualisation, understanding, evaluation and decision. Identifying the escape route is fundamental to ensuring egress is effective and efficient.

Sign designers seeking to find individual solutions for their customers inevitably leads to proliferation, with too many graphical symbols used in the same or similar contexts, thereby endangering the common or universal understanding of important messages. ISO has centralised the task of standardising graphical symbols for use in safety signs for workplaces and public areas within one subcommittee, ISO/TC 145/SC 2, with the latter coordinating the work of three groups: WG1, Safety identification, shapes, symbols and colours; WG2, Signs, plates and labels; and WG3, Safety guidance systems.

These groups have been charged with the task of achieving a uniform, global system of safety information that relies as little as possible on the use of words to achieve understanding. It stems from a recognition that the continued growth in international trade, travel and mobility of labour requires a common method of communicating safety information in order to avoid confusion and prevent accidents.

ISO 3864:1984

This first Standard to emerge from WG1 was principally targeted at sign manufacturers and prescribed which safety colour should be used for which safety message. It prescribed the shape and colour of the various basic types of safety signs (yellow triangle for warning, blue circle for mandatory, etc). Further guidance was given on contrast colours, the black/yellow striped warning band and two examples for supplementary safety signs. Colorimetric and photometric properties of materials and boundaries for safety colours were given, and a rudimentary collection of safety signs was provided as examples.

ISO 3864-1:2002

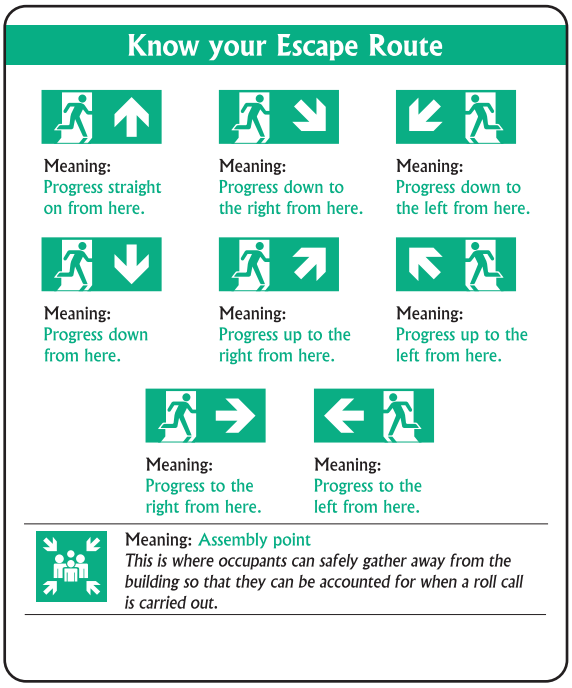
This revised Standard follows the previous edition in terms of the basic guidance but goes into more detail, for example defining dimensions. This ensures that sign manufacturers can easily reproduce safety signs to the exact proportions demanded by ISO 3864-1: 2002.

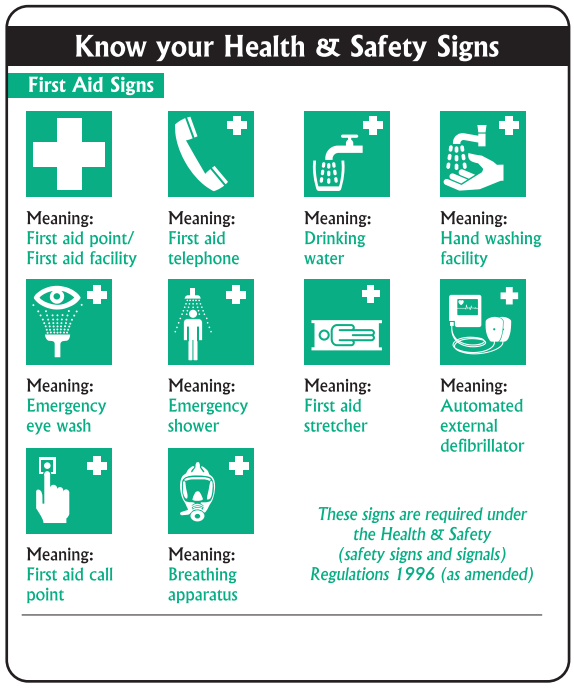
The number of sign and supplementary text panel combinations was increased and the colorimetric section revised to take account of latest scientific knowledge.

ISO 7010

Once the basic guidance for shapes and colours had been established in ISO 3864-1:2002, a structural framework existed for ISO 7010, which was published in 2003. This Standard begins with an overview of the safety signs on which the countries participating in WG1 have reached consensus so far. This is followed by five tables, one for each category:

- **E** **Means of escape and emergency equipment signs** (White graphical symbol on a green square)
- **F** **Fire safety signs** (White graphical symbol on a red square)





Mandatory action signs (White graphical symbol on a blue circle)

Prohibition signs (Black graphical symbol on a white circle within a circular red band and behind a red crossbar)

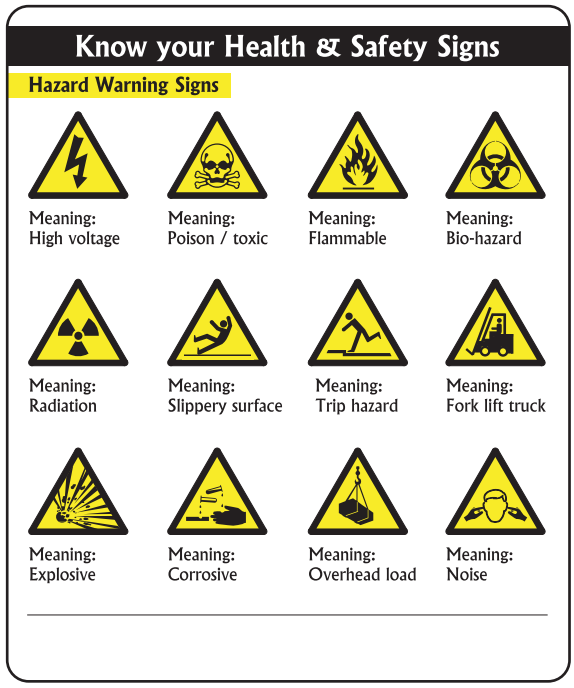
Warning signs (Black graphical symbol on a yellow triangle that has a strong black border)

Each table shows each safety sign within its category together with supplementary information covering its application and a description of the image content. Additional information is given where this is necessary as, for example, in the case of the general mandatory sign, the general prohibition sign and the general warning sign. These signs consist of the geometrical shape plus (except the general prohibition sign which is blank) an exclamation mark as the graphical symbol. Each of these three signs requires a supplementary sign giving more detailed information about the specific hazard. According to the basic guidance given in ISO 3864-1, any safety sign can have a supplementary (text) sign, but these three must have one.

ISO 7010 aims to ensure that, wherever they are in the world, safety signs manufacturers follow the same pattern. The Standard also seeks to give guidance to the designers of safety signs to ensure they achieve overall consistency and, thereby, better universal public recognition. The Standard does not attempt to include every safety sign that carries a graphical symbol, because the sheer numbers developed to cope with particular hazards in specific applications all over the world goes well beyond its scope. The Standard has been deliberately limited to an easy-to-remember set of safety signs with messages that are appropriate for the majority of users, and the palette of safety signs kept small enough for the signs to become part of a common safety 'sign language'.

ISO 16069

This draft Standard emanates from WG3. It aims to bring together the principles of good practice for safety signs outlined in the above Standards with recommendations for safety wayguidance systems to ensure that, through the



consistent application of common design principles, people from anywhere in the world will be better able to recognise and follow directional information to achieve a safe evacuation. As an additional benefit, a standardised safety wayguidance system will assist fire fighters and other rescue teams to evacuate occupied areas during emergency situations.

For an escape route to be effective it is important that from anywhere in the building occupants have sight of a sign, or series of signs, which leads them to a place of safety. Moreover, if there is a choice of escape routes, the safety wayguidance system should indicate the shortest travel distance. To avoid confusion, all of the signs installed should be of similar style, design, size and format. A uniform approach throughout the building builds confidence and reinforces orientation cues, allowing evacuees to predict where the next sign will be.

In order to communicate safety wayguidance information efficiently across language barriers, the systems defined in this Standard incorporate the use of graphical symbols and markings such as arrows, conforming to ISO Standards. Escape route signs should normally consist of three elements: the internationally-recognised graphical symbol for emergency exits, supplementary text (Exit or Fire exit) and a directional arrow.

The Standard also contains general principles valid both for electrically powered and for photoluminescent components. However, illumination of escape routes is not part of the safety wayguidance system and is therefore not covered. There will be certain situations where emergency escape lighting is not needed, and other situations – for example where smoke is present – where emergency escape lighting can lose its efficiency and a safety wayguidance system will be more effective in assisting emergency evacuation.

Where a safety wayguidance system uses electrically powered components, the Standard recommends that an alternative source of power should be provided in case the main power supply fails. Furthermore the safety wayguidance system should be capable of being activated in all risk situations defined by the risk assessments.

For photoluminescent components, including signs, continuous guidance lines and hazard, floor, stair, ramp, stair nosing and door frame markings, the Standard specifies the minimum luminance and luminance decay characteristics of the material to be used. Significant detail is also contained in annexes to the Standard covering sample safety wayguidance layouts representing good design practice and the measurement of photoluminescent component performance both in the laboratory and on-site.

DISCUSSION

Few could argue against the need for a global, common approach to safety signs and wayguidance systems. It is unfortunate, however, that so often the catalyst for change is a major disaster. Following the Piper Alpha exploration platform tragedy, the whole of the North Sea oil industry was subject to changes in the way that the safety of structures was assessed and policed. Similarly, the Bradford City and Kings Cross fires in the UK led to much soul searching and regulatory change. In 1997, the disastrous fire at Dusseldorf Airport in Germany prompted facilities managers all over Europe to look again at their procedures and fire strategies.

The efforts of the ISO committees are to be applauded, but at the end of the day they can only make recommendations. It is down to individual governments to adopt the Standards and apply them at a local level. But who will police them? And will they ever go beyond simply being 'recommendations'?

There is a growing trend for legislation that is not prescriptive. The use of vague phrases creates a nightmare for enforcers and gaping loopholes for the legal profession. This is not good fire safety, it's a recipe for disaster. It leads the fire industry to prescribe the minimum to avoid prosecution. This is certainly not in the spirit of global co-operation envisioned in the International Standards.

Jim Creak is Managing Director of UK-based JALITE plc, manufacturers of photoluminescent safety products, specifically for efficient and effective escape route illumination. JALITE is actively involved in research and standards governing the use and application of photoluminescence and is a Member of the Health and Safety Signs Association and Photoluminescent Safety Products Association.

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Questions of sound and light

LED beacons and sounder/ beacons are now offering a high performance, low power consumption alternative to Xenon beacons.

Bob Choppen, Product Manager with fire protection equipment manufacturers Fulleon, looks at some of the issues surrounding sounders and beacons employed in fire alarm systems

THE SUBJECT MATTER covered in this article is a generalised response to some of the many queries received by our technical and customer support staff everyday. There is no particular theme rather a discussion of some issues that recur with "alarming" regularity.

It would have been possible to skew the piece towards humour based on some of the more absurd and astonishing questions that are posed, but on reflection that would raise the much more serious issue of the competence of some people designing and installing life safety systems. Despite the availability of training courses from organisations like the BFPSA (the British Fire Protection Systems Association) there must still be a small percentage of fire detection and alarm systems that will not perform adequately when required to do so.

SOUNDERS

The aim of a fire alarm system is to warn people of an emergency. Although the primary purpose is usually to motivate people in case of a fire being detected, systems are frequently used in the event of a wide range of situations, from bomb warnings to chemical leaks.

Despite the systems being used to provide a general-purpose evacuation warning, the only application guidance for sounders and beacons available in the UK comes from the fire Code of Practice BS 5839-1: 2002 Fire detection and alarm systems for buildings – Part 1: Code of practice for system design, installation, commissioning and maintenance. It is likely that many questions would not arise if this document were consulted, but the high cost of the standard does act as a dissuader to a wider audience having ready access and therefore relying on the abbreviated guides provided by other organisations.

To be effective the system has to achieve minimum sound levels in defined areas of a building that is sufficient to alert occupants if an emergency occurs. Generally the minimum sound level should be 65dB(A) in all occupiable spaces. However where sleeping persons are concerned the level should be raised to 75dB(A) at the bed head, although it is accepted that even this level may not rouse a small percentage of people who may suffer from hearing impairment or are in a deeper state of sleep due to alcohol or other forms of drug assistance. To achieve 75dB(A) will require a sounder in each bedroom,: the practice of putting sounders in a hotel corridor outside the room will not provide the penetration through modern fire resisting doors and will make the sound level in the corridor uncomfortably high and may impede escape rather than aiding it.

Where the background noise levels are higher, due to the activities taking place in the area, the sound level should be raised to be at least 5dB above the background level to ensure adequate audibility of the signal. If voice sounders are being used then it is recommended that the voice message should be 10dB above the background level to aid intelligibility as well as audibility of the message.

There is, unfortunately, no standard fire alarm signal for the UK. The sound used should however have its prime frequencies in the range between 500Hz

Visual beacons are becoming more widely used as a supplement to audible alarms, both in areas where audible alarms could prove ineffective and also to meet the requirements of the Disabilities Discrimination Act.

and 1000Hz, but the actual sound pattern used is free, so a number of tones are regularly used including, steady tone, two tones and whoops (sometimes called temporal patterns to describe how the signal changes over time). This is a weakness as it becomes difficult to train the general public to differentiate a fire signal from a security alarm or other audible signals. Although the fire alarm signal can vary between individual sites it should be consistent throughout an installation. It is often taken that sound should be "identical" throughout a building, but the actual requirement is for the sound to be *similar.* While it would be ideal to achieve an identical sound throughout a building varying styles of sounder used to cope with different conditions will sound slightly different due to the differing acoustic designs employed even those from the same manufacturer. It is however essential to ensure that in locations where more than one sounder can be heard that their signals are synchronised to avoid masking of the true signal.

Although sounders are usually considered as the primary method of giving an alarm, consideration has to be given to visual alarms as well since sounders alone may not always be effective in warning people. It is recommended that where the background level exceeds 90dB(A) sounders should be supplemented by visual alarms. Other situations too require visual as well as audible warnings: those unfortunate enough to be hearing impaired or who are artificially handicapped by ear defenders will also require visual signals to provide suitable warnings.

Until recent months the provision of visual alarms has been limited to areas of buildings where a specific difficulty with audible alarms was identified. However this situation is changing due to the final stage of the Disabilities Discrimination Act. A general view of the Act is that those with disabilities should not be at a disadvantage compared to their able bodied compatriots, so in public spaces this could lead to much wider use of visual beacons in addition to the normal complement of sounders. .When you consider the statistics from the RNID (Royal National Institute for the Deaf), it is easy to recognise just how wide the adoption of beacons could become. According to the RNID, 1 in 7 people in the UK suffer from some form of hearing impairment and while not all of them wil be unable to hear a conventional alarm, the figure does help to demonstrate the importance of supplementing audible signals with visual indicators.

SOUNDER TYPES

Sounders for fire alarm systems fall into two broad groups, namely "wall sounders" and "base sounders", although the exact terminology varies from supplier to supplier.

Wall sounders, as the name implies, are generally fixed to walls, although they can of course be fitted to ceilings or other stable surface and were at one time almost universally bells of various sizes and operating methods. Now most commonly used is the six inch diameter under-dome bells, so called because the operating mechanism is covered and protected by the gong, so discouraging tampering by idle hands. Eight-inch gongs are less frequently used: they produce a slightly higher sound output and deeper tone, while smaller gongs of around four inches are still occasionally used for smaller spaces such as bedrooms. Bells are still in regular use, but have been usurped by electronic sounders which offer greater versatility with modern electronic fire alarm systems and are arguably more reliable and long-lasting.

Electronic wall sounders are available in various nominal outputs and usually have the facility of a number of different user selectable tones. It is worth noting that the quoted output for an electronic sounder will vary considerably depending on which tone is used. This variability arises due to resonances in the transducer and the frequency characteristics of the acoustic elements of the particular sounder. Typically a general-purpose wall sounder will produce just over 100dB(A) for a current consumption of around 15mA to 18mA. While the sound output is of prime importance current consumption is also a major consideration. The lower the consumption for a specific sounder output; the more sounders that can be accommodated on a circuit.

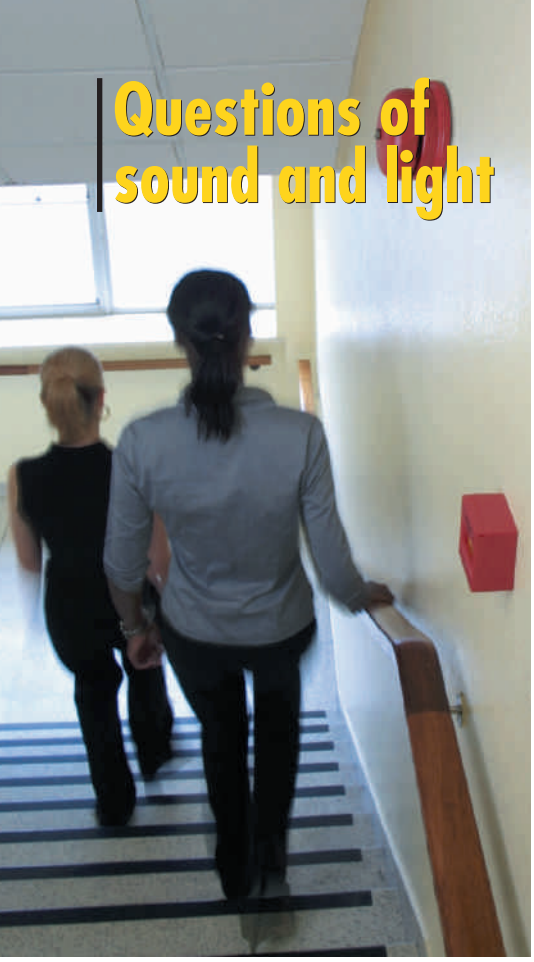
Base sounders are essentially a mechanical reconfiguration of a wall sounder specifically for the purpose of allowing a coincident fixing of a sounder and fire detector. The advantage of the base sounder is the cable and installation savings – it may also provide a more aesthetically acceptable installation in some cases. The down side of the base sounder is the compromised acoustic design so efficiency is lower and for a given current consumption the sound output is lower. For this reason base sounders are frequently used in bedrooms and small offices where background noise is low and the space restricted.

ADDRESSABLE SOUNDERS

Addressable systems have specialised sounder requirements, which are driven by the limited power available on the detection loop. For this reason addressable sounders exploit various

The lack of a standard fire alarm signal for the UK means it is difficult to train the general public to differentiate a fire alarm signal from a security alarm or other audible signals.

Questions of sound and light



The objective of a fire alarm system is to warn people of an emergency and provide the opportunity for a safe and orderly evacuation of the building.

techniques to achieve much higher efficiencies than their conventional counterparts. The trade off is usually that the range of tones is more restricted as the sounder is effectively tuned to operate over a narrow band of frequencies. Because of the power limitations very loud addressable sounders driven directly from an addressable loop have not yet been made available.

It must also be remembered that addressable sounders are compatible only with the specific communication protocol they have been designed to work with, whereas conventional sounders, requiring only power to operate, are more or less universally compatible with any sounder circuit.

So why use addressable sounders? Despite higher costs they do provide several advantages both in terms of simplified installation and operational flexibility. The capabilities of systems do vary considerably, but addressable sounders can be configured to operate in different arrangements to suit, say, a change in use of part of the protected building using software tools rather than the rewiring that might be required for a conventional system.

POWER

It is tempting to think that doubling the number of sounders in a space will make them sound twice as loud. This would double the current required to run the sounders and would add 3dB to the measured sound level, but would add only marginally to the perceived sound level. The reason behind this is not a conspiracy from sounder manufacturers but a facet of human hearing that requires a 10dB change in sound level to achieve what appears to be a doubling of the sound level. This approximates to a ten fold increase in current to achieve an apparent doubling of sound level.

BEACONS

As mentioned earlier the role of beacons is assuming greater importance due to the improving disabilities legislation. The use of beacons on fire alarm systems has always been more difficult than sounders to engineer, as the power required to operate xenon beacons or incandescent lamps is much greater than a typical electronic sounder. Xenon beacons in particular provide a difficult load for fire alarm systems, taking very high current pulses at switch-on and then after each flash. Even though some units have electronics that specifically overcome the current pulses the average current is still high enough to prohibit direct connection to an addressable system loop. Technology does however move on, and there have recently been a raft of new beacons based on LEDs rather than xenon flash tubes. These new devices offer current consumptions in the region of 3 to 6mA mirroring typical electronic sounders, therefore allowing addressable units for the first time.

For fire systems beacons should be red with a flash rate between 30 and 130 flashes per minute. There is no guidance as to the light output, but they should be bright enough to attract attention, but not so bright that glare is caused.

Although the Disabilities Discrimination Act is beneficial for the majority, the potential for the increased use of beacons does cause concern for those who suffer with Photosensitive Epilepsy. The problem is not just confined to the person who is suffering the distress of an attack, but also those trying to leave and move past the sufferer and anyone attempting to care for them.

The risk primarily occurs in multiple beacon installations where the beacon flashes are not synchronised. Guidance suggests that attacks are rarely triggered by light flashing at less than 5Hz, so to keep potential sufferers safe attempts should be made to keep any beacon flash rates well below this figure. Commercially available beacons used with fire systems normally operate at around 1Hz; so single beacon installations are unlikely to be a trigger. Where multiple beacon installations are employed, the risk rises if more than one beacon can be viewed at any one time and the beacon flashes are not synchronised. This situation can provide the viewer with a composite flash that is effectively at a higher rate than the individual beacons. Fortunately there are two possible solutions, one is to ensure that the layout of the beacons is such that no more than three can be seen from any position in the building, thus limiting any composite flash to 3Hz and well below the 5Hz limit suggested. If it is not possible to achieve such a layout, then the beacons used should be able to be synchronised to flash in unison so that a multiple flash is not apparent.

The use of beacons on fire alarm systems has always been more difficult than sounders to engineer, as the power required to operate xenon beacons or incandescent lamps is much greater than a typical electronic sounder.

INFORMATION

Sounders and beacons are potentially some of the simplest devices used on a fire detection system, yet the information regarding use and application can be hard to find, particularly for those who have a life outside of this specialised industry. Despite their simplicity the answers are not always straightforward and rarely what the questioner wants to hear.

Aspirating Smoke Detection

By Peter Massingberd-Mundy, Technical Manager (Europe) Vision Systems – VESDA

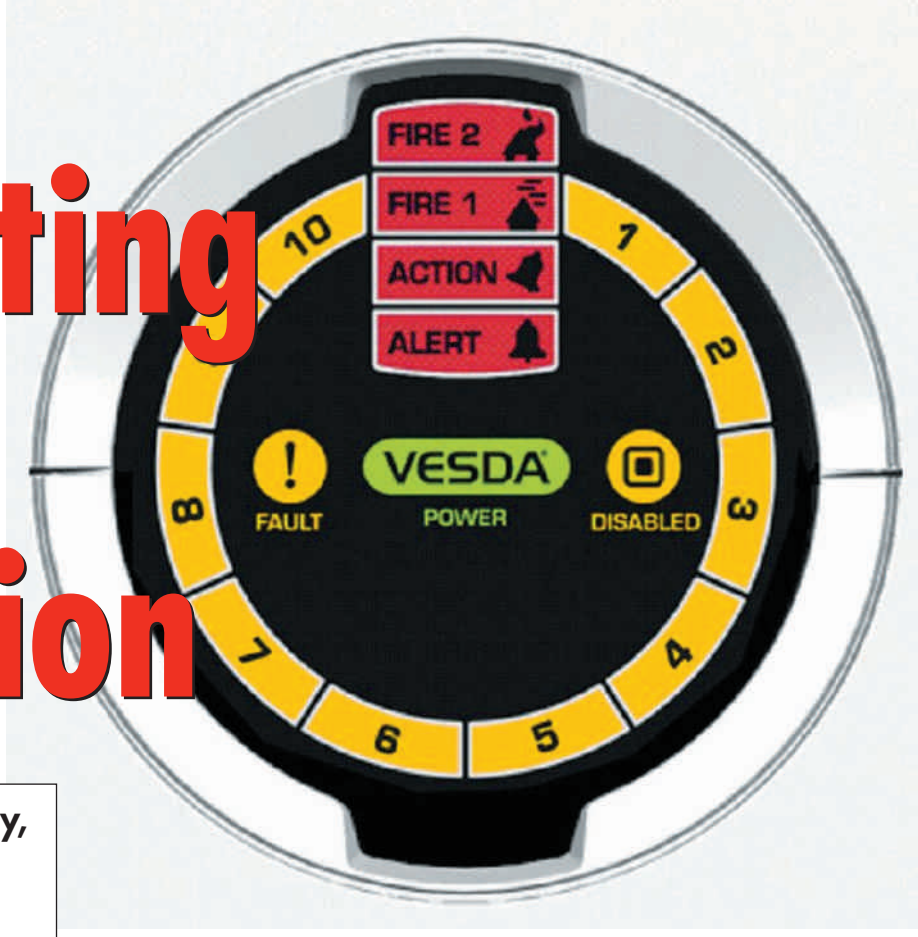


Figure 1. The "smoke dial" recently introduced on the latest HSAD system.

The advances in smoke detection have been many and varied, here IFP takes a look at the some of the fundamentals of high sensitivity aspirating technology and reviews the latest aspirating smoke detection technology.

ASPIRATING SMOKE DETECTORS (ASD) come in many forms; this article focuses on ASD systems designed to provide very early warning which use High Sensitivity Aspirating Detection (HSAD) technology. There are several less sensitive systems which use enhanced point detection technology (or derivatives thereof) as the sensing device but these do not generally match the sensitivity or high specification of HSAD systems with their on-board event logs, wide dynamic detection range, comprehensive filtration techniques and referencing capabilities.

HSAD systems are packed with technology but there is insufficient space in this article to cover it all so the focus is on the smoke detection technology (absolute fixed calibration vs detection relative to the environmental conditions), on the display methodology and finally on the flow monitoring technology. Other subjects such as; developments in aspirator design, filter technology, communication/reporting systems and the general trend towards more compact ASD systems covering smaller areas are beyond the scope of this article.

DETECTION TECHNOLOGY

The first generation HSADs (circa 1985) used a xenon lamp with a broad spectrum light source to ensure detection of the various smoke types (e.g. particle size, shape and colour) produced by different fire sources. Some 3-4 years later a laser based particle counter was introduced which also gave a response largely independent of smoke type. These two technologies are widely regarded to be the founding fathers of Early Warning ASD.

These early technologies were not without some limitations, the most notable being the slow decay of the Xenon light source which meant that it required recalibration every 2-4 years and the delicacy in setting up the avalanche diode used in the laser counter. Some features were introduced to overcome these issues such as Auto-CAL which effectively provided drift compensation to counter the decaying intensity of the Xenon light source.

During 1993 another laser-based technology became available incorporating adaptive algorithms. This detector technology relies on the adaptive algorithms to set appropriate alarm thresholds depending on the background signal measured in the environment. It has some advantages in that setting up of the unit is relatively simple but the thresholds and effective sensitivity of the detector are not fixed and there is no guarantee that the performance verified during commissioning of the unit will be maintained – particularly in the event of slow growth fires and in challenging/changeable applications where pollution/environmental variations are commonplace.

In 1996 a laser based fixed calibration detector was introduced which was demonstrated to offer a similar detection performance to the original xenon lamp technology but introduced some unique features in the form of a 2 stage filter and a clean air supply. The first stage of the dual-stage filter removes very large particles (i.e. fibers and larger dirt particles) that could interfere with smoke measurement and possibly contaminate the chamber. The second stage of the filter produces a highly filtered air flow which is passed into specific "clean

Aspirating Smoke Detection

air" ports to achieve a positive pressure barrier for critical components in the detection chamber, thereby preventing dust or smoke from being deposited on optical surfaces. The consequence of this is the continued accurate calibration of the detector giving reliable and repeatable performance without resorting to drift compensation (applied over long periods) or complex adaptive algorithms (applied over shorter periods) to compensate for the degradation in detection performance.

Other laser based technology and cloud chamber technology solutions exist but these account for less than 10% of the market and are beyond the scope of this article. It is also worth mentioning that in 1996 laser based point detectors were introduced to provide early warning capability with the added advantage of addressability. However, the questionable value of addressability in high air flow environments and several other factors have resulted in a low uptake of this technology.

When considering which ASD system to use there is a fundamental decision to be made in relation to the risk being protected; should you use a system that is absolutely calibrated and stable or depend on a system that operates as a relative device, setting alarm sensitivity levels according to the environment using adaptive algorithms or compensating for contamination of the detector using drift compensation? Most users choose the former for their high risk applications.

DISPLAY TECHNOLOGY

Bargraph representation of the smoke level detected in an environment is synonymous with HSAD – the very first generation HSADs included this type of display and later generations generally offer it – as least as an optional extra. The intention is that the bargraph represents the "risk" although it was not until 1997 that the idea of scaling the bargraph to represent the fire level (with 10 bars = Fire) was introduced. The originally 10 segments bargraph has developed into 20-_ segments, has had threshold indicators added and has been represented as an exponentional display. The most recently launched HSAD system boasts a circular "smoke dial" (Figure 1) which allows users to gauge the risk instantly, even from a distance, because completion of the circle intuitively communicates that the Fire level has been reached. This is a new approach and follows good instrumentation practise found on other high technology systems.

Presenting the true smoke level is not without its challenges because, while it potentially reveals exactly what is happening in the environment it may also present any drift in calibration of the detector. For example, if there is a consistently high background level this would be shown as perhaps 2-3 segments and in some cases might mislead an un-informed end user. One manufacturer introduced a feature called "auto offset" which forced the bargraph to always read = bar until smoke above 3 bars was detected. On more recent generations the same sort of "corrections" are effectively applied by the use of adaptive algorithms or drift compensation. By contrast the absolutely calibrated detectors generally present the smoke reading as detected by the sensing chamber and, as a result of the constantly stable calibration of the detector, it is possible to explain to the un-informed end user mentioned above that the high reading reflects the true background reading and (most importantly) an adjacent detector will show a similar reading. So in summary, the bargraph reading is not always what it seems – on some devices it presents an absolute indication of the smoke in the environment while on others it indicates some measure of the smoke relative to a longer term average reading.

FLOW MONITORING TECHNOLOGY

While smoke detection technology and sensitivity is often the focus of HSAD comparisons, their flow monitoring capability is equally important. All ASD systems are totally reliant on the robustness and integrity of the pipes.

Regular maintenance of the pipe network and sampling holes is essential to ensure ongoing performance. BS5839 (clause 45.4f and other international standards) now recommends that all sampling holes are smoke tested at least annually. This recommendation is widely supported by the ASD industry as good practise but may be impractical in many installations – particularly those where ASD has been installed for the express purpose of overcoming access restrictions. A revision to BS5839 is in process which is intended to address this by presenting alternative means of satisfying the requirement – for example by confirming that the flow monitoring is capable of detecting loss of a single sampling point, or measuring and checking the transport time from the last hole, or measuring the pressure at holes that are accessible.

It is worth recognising that holes do not normally become blocked individually but rather all the holes in an application tend to become contaminated at a similar rate and flow rates fall proportionately. Naturally the speed of contamination depends on the environment with detectors in relatively clean computer rooms becoming contaminated much slower than those protecting coal conveyors! However, there are exceptional situations such as where there is a high risk of malicious intent (e.g. prison cells) or a particularly challenging environment with fibrous contamination. In such applications monitoring of individual holes or frequent maintenance measures may be justified.

Unverified reliance on the flow monitoring capability to detect sample hole blockage is not good practice – particularly on larger systems. As an example, modelling of a system with four pipes shows that with good balance (i.e. similar flows entering all the sampling points), blocking a single hole on a 48 hole system only reduces the flow

It is worth recognising that holes do not normally become blocked individually but rather all the holes in an application tend to become contaminated at a similar rate and flow rates fall proportionately.

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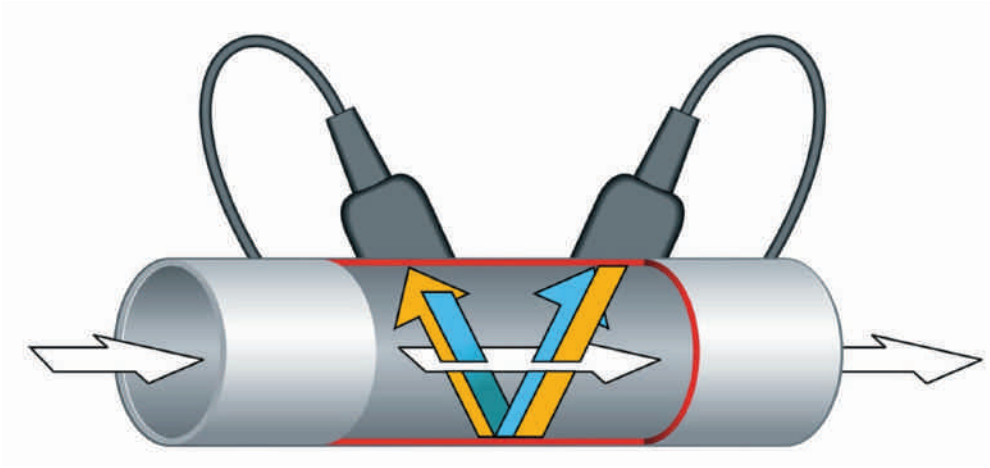

Figure 2. How ultrasonic flow sensing works.

through the detector by <1% which is almost impossible to detect reliably. However the flow through the pipe with the blocked hole is reduced by about 5%. It is therefore advisable that on larger systems a HASD system with multiple inlet pipes, each with individual flow sensors, should be used as it provides significantly better flow monitoring capabilities.

It is important to note that with larger holes on the end caps to improve the transport time, a 4.3% change in flow is observed in the one pipe when a single hole is blocked. This may not seem significantly different from the 5% change on a balanced system but the latter does amount to a 16% greater change in flow rate which is easier to detect. It is therefore arguable that a more balanced system has better hole detection capability but this is at the expense of transport time. In the example giving the transport time is 12 seconds better – (48 seconds as opposed to 60 seconds) on the system with larger end holes. It very much depends on the system/application requirements and future generations of modelling software will reflect this fundamental design compromise.

A single pipe system with only 12 holes shows a similar 5% reduction in flow when a single hole is blocked. While it may be possible to demonstrate detection of such a change during commissioning, it is unlikely that the performance of the system will be maintained unless the environment is particularly clean and stable and/or the flow monitoring technology is inherently tolerant to interference and contamination. This practical reality it reflected in the fact that the most challenging type testing requirements for ASD systems (Norm F3014 & prEN54-20) is that they must reliably detect a 20% change in flow.

Most ASD systems use a thermal loss or pressure device, which is situated in the flow to provide an indication of the flow rate. In both cases the phenomenon being measured is secondary to the measurement required – i.e. flow rate – and are consequentially susceptible to other influences – temperature, pressure and most importantly contamination of the sensor.

Moreover, it is universally the case that when commissioning an ASD system the "normal" flow rate is determined and, in operation, excessive changes from that normal flow rate are signalled as a flow fault. This flow setup or "normalisation" process is typically only done at commissioning and invoked manually but there are some HSAD systems which set the normal flow automatically every time the unit is turned on. This means that contamination issues (of both sensor and/or sampling holes) can be inadvertently masked and such systems should be used with extreme caution in environments where regular smoke testing of individual sampling holes in accordance with BS5839 is not practical.

The breaking news is that the latest technology to emerge in HSAD systems is *ultrasonic flow sensing* which measures the velocity of the flow. Two transducers (refer to figure 2) are placed on a section of pipe inside the detector. Each transducer sends a signal to the other, one signal going with the flow of air and the other against it. The time difference between the arrival of both signals is then used to calculate the flow rate of the air in the pipe. The challenge in using ultrasonic flow sensing for an air sampling detection system was to make the device small enough and sensitive enough to be suitable for monitoring air rather than fluids.

Ultrasonic flow sensing offers many advantages over other flow sensing technologies:

- tolerance of contamination,
- immunity to temperature changes,
- not affected by altitude
- absolute flow measurement in litres per minute, rather than a relative measurement of the change in flow.

These elements contribute to a high level of reliability for the lifetime of the product and, more importantly, provide absolute flow measurement regardless of the temperature, elevation of the environment or the contamination of the flow sensors.

CONCLUSION

The developments in ASD technology have been numerous over the years but the smoke sensing technology falls into two distinct camps – detectors with absolute calibration and fixed alarm thresholds which include measures to prevent contamination, and detectors which use adaptive alarm algorithms or rely on longer term drift compensation to maintain the integrity of the smoke detection system. Informed selection between the two approaches is essential and this article has highlighted some of the more important issues. On other aspects of ASD technology, recent developments in display design and the introduction of ultrasonic flow sensing to provide contamination tolerant flow monitoring herald a new generation of HSAD systems.

It is important to note that with larger holes on the end caps to improve the transport time, a 4.3% change in flow is observed in the one pipe when a single hole is blocked.

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From prescriptive to r will it work?

By Lucia Dunbar, Serco Assurance
www.sercoassurance.com/fire

CAN RISK ASSESSMENT BASED LEGISLATION ever fully replace prescriptive regulation? In July 2002 a consultation paper was issued by the Office of the Deputy Prime Minister on the subject of reform of fire safety legislation (Reference 1). Central to the issue of this paper was the intention to 'simplify, rationalise and consolidate the law with respect to fire safety in building in use' and a risk assessment based approach was seen as a key instrument to achieve this.

There is no doubt that good risk management can achieve remarkable results. A recent article on the role of risk management in property protection (Reference 2) reported on how the implementation of a risk management programme was instrumental in limiting the consequences of financial loss for a food producer. The company was affected by a fire, but its understanding of risk and the provision of focused protection they had put in place after the risk assessment averted what could have been total site destruction estimated at £45 m. The loss was contained to a more manageable £650k.

However, despite the clear advantages of adopting the risk assessment approach in such cases, departing from prescriptive based has its own drawbacks.

Prescriptive limits may be perceived as being restrictive and cumbersome by a designer, because, once set, they cannot be exceeded. Inflexible travel distance limits or fire resistance standards, for example, may lead to design solutions that are unreasonably expensive when looked at from the risk manager's point of view. However, there is a major advantage in setting prescriptive standards, and this makes this approach popular with both employers and employees alike: what has to be done is clearly and unambiguously stated. Checking that the standard requirements have been applied is relatively straightforward and companies know that their competitors are required to undergo the very same process. So, prescriptive standards are often simple to enforce and they are perceived to be fair, as they are more easily applied across all business consistently.

Conversely, an approach that focuses on risk based assessment is goal setting. Whilst the objective of maximising safety may be clear, the best means to achieve this may not be so immediately apparent. This is reflected in the use of terms such as "suitable", "sufficient" and "adequate" to define the measures to be adopted to assure safety. Such terms can be difficult to translate into unambiguous checking criteria and, by definition, they will different at least to some extent for each business. A recent study on the impact of using words such as these in the legal framework (Reference 4) has shown that these terms pose problems when the reference to the law is invoked in court cases, since they are open to interpretation. From an employer's point of view, risk based assessments are a mixed blessing. Whilst they grant businesses a degree of flexibility with respect to satisfying legal requirements, there is the possibility that the business may get it wrong, or its competitor might get away with a cheaper way of complying.

Checking that the standard requirements have been applied is relatively straightforward and companies know that their competitors are required to undergo the very same process.

The legislator may welcome the risk based approach as a way to remove the need to tailor the regulations precisely to the diverse types of businesses, since it is up to the business owner to demonstrate that the measures adopted are suitable for its activities. It is also a way for the regulator to encourage the application of highly effective safety solutions even where these had not been yet identified at the time the legislation was passed. There is no longer a need to update the legislation documents to keep up with technological advances, nor to provide a large body of very specialised standards, with consequent major savings of costs and time. At the same time, the enforcing authorities can require the application of new solutions (be they technological or managerial) without delay and the benefits can be felt immediately by the community.

However, the flip side of this flexibility is that the law must contain a certain amount of flexibility also in its definition of what makes solutions acceptable. Given that a key requirement for a piece of legislation to be effective is that it should be practicable to enforce, the criteria for compliance have to be unambiguous for all instances where the law applies. These criteria must be clear to understand and implement both by those who must comply with the law and those who must enforce it. There is, therefore, an obligation by the legislator to promote clarity and to ensure that measures are in place to educate those

isk based legislation:

who are responsible for complying with the law and for enforcing it.

If properly applied, a risk based approach will enhance rather than reduce the protection currently afforded by prescriptive legislation, and can do so with reliance to a much more streamlined set of obligations. Familiarity with the full body of safety of the legislation will be easier to acquire as there will be fewer regulations in number and the same risk management theme will permeate them all. The law will encourage employers to take responsibility for the ultimate goal of safety rather than for compliance with an imposed regime.

However, the way enforcement of the risk based approach is applied is critical. For example, if the programme of inspection intended to check that the law is applied were to be based solely on the magnitude of risk, as proposed in the consultation paper, this may encourage lower risk companies to believe that an inspection is not likely to affect them. This may tempt them to be less diligent than they should be.

Another aspect of enforcement has to do with the fact that risk assessment requires specialist knowledge. It is relatively easy to check that a fire detector installation has complied with the required number of automatic fire detectors per unit area and have been manufactured to the declared kite mark standard. It is more difficult to be able to make the case that the detectors have been placed in the most suitable location and their number optimised according to the use of the business on the premises.

Yet there is evidence that an effective risk based approach may be required. Another ODPM report (Reference 3) states that between 1997 and 2001 there has been a 7% increase in the number of cases of fire where the automatic detector failed to operate. The main reason for this in non-domestic dwellings, which include industrial premises, was attributed to 'fire products not reaching the detectors'. This cause, which is not to be confused with 'Detector siting poor', already listed as a separate cause, applied to a staggering number of cases (over 75% of fires in this type of building). A better understanding of the risk of fire, as is required when applying a risk based approach, would have resolved this in most cases.

On balance, the shift to a risk based approach is to be welcome. However, its success in terms of effectiveness in protecting life and property depends on the ability of any risk assessment based legislation to provide for effective enforcement namely:

- to ensure that businesses are in the position to appreciate what it takes to carry out a comprehensive risk assessment, in terms of understanding the employer ultimate responsibility and appreciating the specialist skills involved.
- to ensure that checking is carried out through a process that captures at least the same number of businesses as are currently subject to the fire certification process
- to provide the means to ensure that risk assessments are carried out at the required standard of competency including the requirement for independent checking to be carried out where necessary.
- to apportion legal responsibilities in proportion to the ability of the person responsible to comply with the legal requirement. For example, the respective responsibilities of a business that occupies a building (and has no power to modify or equip the premises) and those of the owner of the building should be clear an unambiguous. This should be both with respect of how the risk assessment is carried out and how the resulting conclusions acted upon.
- to ensure that business alterations and new business instances are treated consistently, so that risks relating to all business ventures are adequately captured.
- to provide clear and unambiguous guidelines as to how the effectiveness of the a risk assessment based legislation is to be measured, both in terms of its ultimate goal of reducing threat to life and property and in terms of how effectively the legislation is enforced.

It is relatively easy to check that a fire detector installation has complied with the required number of automatic fire detectors per unit area and have been manufactured to the declared kite mark standard.

REFERENCES

1. A Consultation Document on The Reform of Fire Safety Legislation, Amending Various Acts and Statutory Instruments to Simplify, Rationalise And Consolidate the Law With Respect to Fire Safety in Buildings in Use – A Consultation Paper issued by The Office of the Deputy Prime Minister, July 2002.
2. Bond M., Loss Adjustments, Fire Prevention, Fire Engineers Journal, April 2004.
3. Fire Statistics United Kingdom, 2001 29 April 2003.
4. Regulatory uncertainty in Performance Based Regulations – Analysis of the Uncertainty in STUK Guide YVL 4.3 Fire Protection at Nuclear Facilities in Finland, 5th International Conference Fire and Safety, Munich, March 2004.

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THE DECEMBER 31, 2003 DEADLINE, set by European Community (EC) Regulation 2037/2000, requiring European Union members to decommission all "non-essential" halon fire protection systems has passed. China will discontinue production of Halon 1211 by the end of 2005 and all Halon 1301 by 2010. Production of new halon in the United States has ceased and installation of new halon systems is prohibited. With the global trend of eliminating the use of halon gases for fire protection purposes, the need for acceptable halon replacements is apparent. The fire protection market is inundated with clean agent halon replacements for use in both fixed and portable systems.

By Corey C. Weldon

This article will discuss some of the more widely used clean agent halon replacements in the U.S. The clean agents described, and the associated product and system manufacturers, are by no means a complete listing of those available. Agent properties and characteristics were obtained from published product literature.

BACKGROUND

Prior to the Montreal Protocol, installing clean agent fire suppression systems most likely meant employing one of the following two agents: Halon 1211 and Halon 1301. Halon 1211 (bromochorodifluoromethane) was utilized primarily as a streaming agent for local application via portable and wheeled fire extinguishers. Halon 1301 (bromotrifluoromethane) was also utilized to some degree as a streaming agent, but its primary use was in fixed total flooding applications. As a result of the Montreal Protocol, production of halons was discontinued in developed countries at the end of 1993. Since then, the industry has put significant effort into research and development of more environmentally friendly clean agent halon replacements. In the U.S., all new clean agents must receive Significant New Alternatives Policy (SNAP) endorsement from the Environmental Protection Agency (EPA).

The SNAP policy was established under the Clean Air Act. Under the SNAP, the EPA is required to evaluate alternative agents intended to replace known ozone-depleting substances (i.e. halons) for both environmental and toxicological effects. Further, SNAP makes it is illegal to replace Class I or Class II ozone depleting substances with substitutes the EPA has determined may present adverse effects to human health or the environment when other substitutes are available that reduce overall risk to health or the environment.

The aforementioned EPA SNAP evaluation is performed for each specific application of the agent (i.e. streaming, flooding). A list of acceptable alternatives for both Halon 1211 (Streaming Agents) and Halon 1301 (Total Flooding Agents) is published by the EPA.[1] As such, agents like HFC-227ea, which may be used for both total flooding and streaming applications, must be evaluated against multiple sets of criteria.

BASICS OF CLEAN AGENTS

NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*, contains the minimum requirements for total flooding clean agent systems. The standard defines a clean agent as "an electrically nonconductive, volatile, or gaseous fire extinguishant that does not leave residue upon evaporation". In general, clean agents fall into two categories: Halocarbons and Inert Gases.

Halocarbons are organic compounds containing one or more of the elements fluorine, chlorine, bromine, or iodine.[2] Characteristically, halocarbons are very adept at absorbing heat and many are also used a refrigerants. Primarily, halocarbons extinguish by absorbing heat faster than it can be generated by the combustion process. Some halocarbons also extinguish fire by forming free radicals during thermal decomposition that interfere with the chemical chain reaction required to maintain the combustion process.

Inert gas agents contain one or more of the gases helium, neon, argon, or nitrogen. Inert gases that are blends of gases can also contain carbon dioxide as a secondary component.[3] Extinguishment with inert gases is accomplished by reducing oxygen and/or fuel concentrations in the hazard area below the level required to support the combustion process. Ambient air contains approximately 78 percent nitrogen, 21 percent oxygen, and one percent other gases. In most cases, the combustion process cannot be sustained in an environment containing less than 15 percent oxygen.

Total flooding applications are those in which the agent is discharged to achieve a specific minimum agent concentration throughout the hazard space. Examples of occupancies using total flooding applications include computer server rooms, document archive storage rooms, and art galleries. Total flooding applications typically use engineered or pre-engineered fixed systems.

Streaming or local applications are those in which the agent is discharged directly onto the hazard. Examples of conditions that may use streaming applications include protection of engine compartments or wet benches in semiconductor fabrication. Steaming applications may be protected by either fixed or portable systems. Fire extinguishers are prime examples of portable streaming systems.

ENVIRONMENTAL PROPERTIES

Three main environmental factors are discussed when evaluating clean agents: Ozone Depleting Potential, Global Warming Potential, and Atmospheric Lifetime.

Ozone Depleting Potential (ODP) is the potential of a gas to deplete stratospheric ozone as compared to a benchmark gas.[4] The rate at which Halon 1211 and 1301 contributed to ozone

Global Warming Potential (GWP) is a measure of the impact caused by a gas over time by adding a unit of mass to the atmosphere, as compared to the same unit of mass of a benchmark gas.

depletion is the reason its production ceased. Clean agent replacements typically have substantially lower ODP values, if not zero ODP values. Under the Clean Air Act (CAA), all gases having non-zero ODP values less than 0.2 are classified as Class II ozone depleting substances (ODS) and must be phased out of production by 2030.[4] ODP values are given in relation to CFC-11 (trichlorofluoromethane), which has a value of 1.

The EPA definition of atmospheric lifetime is the approximate amount of time it would take agent concentration to return to its natural level (assuming emissions cease) as a result of either being converted to another chemical compound or being taken out of the atmosphere via a sink.[5] It is the primary factor in determining the overall effect of a gas.

Global Warming Potential (GWP) is a measure of the impact caused by a gas over time by adding a unit of mass to the atmosphere, as compared to the same unit of mass of a benchmark gas. It is a function of the atmospheric lifetime of a gas and the ability of the gas to absorb infrared radiation, thus adding to the global warming phenomenon. All GWP values listed in this article represent global warming potential over a 100-year span relative to carbon dioxide.

CARBON DIOXIDE

The minimum requirements for carbon dioxide systems are contained in NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*. While carbon dioxide extinguishing systems do not fall under the scope of NFPA 2001, CO_2 is still considered by many to be the original clean agent. It is a naturally occurring, colorless, odorless, electrically nonconductive inert gas used in both total flooding and streaming applications. Extinguishment by carbon dioxide is accomplished by reducing the concentration of oxygen, and/or the vapor phase of the fuel, in the fire area below the quantity required to sustain combustion.

Carbon dioxide is a naturally occurring greenhouse gas and has an ozone depleting potential of zero and atmospheric lifetime of approximately 120 years. Carbon dioxide is the benchmark used for evaluating global warming potential (GWP) affect of other agents.

Carbon dioxide is incompatible with powdered aluminum, beryllium, cerium alloys, chromium, magnesium-aluminum alloys, manganese, thorium, titanium, zirconium, cesium oxide, and metal acetylides.

Carbon dioxide discharge, when present in quantities sufficient to extinguish fire, can create conditions of reduced visibility and low oxygen content. It is imperative that appropriate safeguards be put in place to protect personnel if this agent is to be utilized.

Manufacturers producing fixed carbon dioxide extinguishing systems include Ansul Incorporated and Fike Corporation. Portable carbon dioxide fire extinguisher manufacturers include Kidde Safety and Badger Fire Protection.

IG-541

IG-541 is a colorless, odorless mixture of naturally occurring atmospheric gases (52 percent nitrogen, 40 percent argon, eight percent carbon dioxide). Manufactured under the trade name Inergen® by Ansul Incorporated, IG-541 is an inert gas agent used in total flooding applications. IG-541 reduces the oxygen content to approximately 12.5 percent (below that required to sustain combustion) and increases the carbon dioxide level to three percent. The increased level of carbon dioxide in the environment stimulates the respiratory rate and the body's ability to absorb oxygen, thus compensating for the decreased oxygen level. As a result IG-541 is safe for use in occupied spaces.

IG-541 has an ozone depleting potential of zero and a global warming potential of zero. While discharge of IG-541 releases nitrogen, argon and carbon dioxide into the environment, product literature indicates that IG-541 does not contribute unique chemical species with extended atmospheric lifetimes. Its material compatibility characteristics are very similar to those described above for carbon dioxide.

HFC-227EA

HFC-227ea is halocarbon suitable for use with both total flooding and streaming applications. The agent is an odorless, colorless liquefied compressed gas. As with other halocarbons, extinguishment is accomplished primarily by heat removal. However, extinguishment is also accomplished to a smaller degree by the thermal decomposition of HFC-227ea. The decomposition produces free radicals that interfere with the chemical chain reaction required to maintain the combustion process. HFC-227ea is safe for use in occupied spaces.

HFC-227ea has an ozone depleting potential of zero, a global warming potential of 2900, and an atmospheric lifetime listed as 31-42 years.

HFC-227ea is incompatible with alkali metals, alkaline earth metals, and powdered aluminum or zinc. At high temperatures, the agent may thermally decompose to produce the following hazardous by-products: hydrofluoric acid, carbon monoxide, carbon dioxide, and carbonyl fluoride.

HFC-227ea is marketed under the trade names FM-200™ (when manufactured by Great Lakes Chemical Corporation) and FE-227™ (when manufactured by DuPont). The agent is utilized in total flooding suppression systems manufactured by Chemetron Fire Systems, Fike Corporation, Kidde-Fenwal, and Pem All Fire Extinguisher Corporation. Firetrace

Carbon dioxide discharge, when present in quantities sufficient to extinguish fire, can create conditions of reduced visibility and low oxygen content.

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NOVEC 1230™ appears to be the most environmentally friendly of the clean agent halon replacements. It has an ozone depleting potential of zero, a global warming potential of 1, and an atmospheric lifetime of 5 days.

Automatic Suppression Systems lists both local and total flooding HFC-227ea systems on their website.

HFC-125

HFC-125 is a halocarbon marketed by DuPont, under the trade name FE-25™, as a retrofit alternative for existing Halon 1301 total flooding systems. The agent is a clear, colorless liquefied gas noted to have a slight ethereal odor. As with other halocarbons, extinguishment is accomplished primarily by heat removal. HFC-125 also accomplishes extinguishment, to a lesser degree, by forming free radicals during thermal decomposition that interfere with the chemical chain reaction required to maintain the combustion process. HFC-125 is safe for use in occupied areas.

HFC-125 has an ozone depleting potential of zero, a global warming potential of 2800, and an atmospheric lifetime of 32.6 years.

HFC-125 is incompatible with alkali, alkaline earth metals, and powdered aluminum, zinc, or beryllium. At high temperatures, the agent may thermally decompose to produce the following hazardous by-products: hydrofluoric acid and carbonyl fluoride.

HFC-125 is utilized in the Fike Corporation ECARO-25™ total flooding fixed suppression system. ECARO-25™ is advertised as a one-for-one cylinder replacement with halon, requiring system flow calculations and replacement of existing nozzles. Kidde Aerospace manufactures HFC-125 fire extinguishers currently utilized in U.S. Navy's F/A-18 E/F "Super Hornet" aircraft.

NOVEC 1230™

NOVEC 1230™ Fire Protection Fluid is a fluorinated ketone manufactured by 3M Corporation and described as having the appearance of water. It is suitable for used in both total flooding and streaming applications. The agent is stored as a liquid and discharged as a gas. As a result of agent's thermophysical properties (i.e. low heat of vaporization, high vapor pressure) the liquid rapidly changes phases to a gas upon exposure to air. NOVEC 1230™ is a safe for use in occupied areas.

NOVEC 1230™ appears to be the most environmentally friendly of the clean agent halon replacements. It has an ozone depleting potential of zero, a global warming potential of 1, and an atmospheric lifetime of 5 days.

NOVEC 1230™ is not compatible with strong bases, amines, and alcohols. When applied to fire, the agent may thermally decompose to produce the following hazardous by-products: hydrogen fluoride, carbon monoxide, and carbon dioxide.

NOVEC 1230™ Fire Protection Fluid is utilized as a total flooding agent in the Sapphire Suppression System recently introduced by Ansul Incorporated.

HCFC BLEND B

HCFC Blend B, more commonly known as Halotron® I, is a pressurized halocarbon liquid containing approximately 93 percent HCFC-123 and seven percent proprietary gas mixture.

HCFC Blend B has an ozone depleting potential of 0.014, a global warming potential of 90, and an atmospheric lifetime of 3½-11 years. As a result of its non-zero ozone depletion potential, HCFC Blend B is categorized as a transitional substance.

HCFC Blend B is incompatible with alkali, alkaline earth metals, powdered metals such as aluminum and zinc, and oxidizers. At high temperatures, the agent may thermally decompose to produce the following hazardous by-products: hydrogen fluoride, hydrogen chloride, and carbonyl halide.

The agent is manufactured by the Halotron Division of the American Pacific Corporation as a Halon 1211 replacement for use streaming applications. The agent is utilized in portable handheld fire extinguishers by Amerex Corporation and Badger Fire Protection.

HFC-236FA

HFC-236fa is manufactured by DuPont™, under the trade name FE-36™ Fire Extinguishing Agent, as a replacement for Halon 1211 in streaming applications. According to DuPont™, FE-36™ also functions well as a flooding agent at room temperature. HFC-236fa is a colorless liquefied halocarbon gas discharged as a stream of gas and liquid droplets.

HFC-236fa has an ozone depleting potential of 0, a global warming potential of 6300, and an atmospheric lifetime of 209 days.

In the presence of moisture, HFC-236fa is incompatible with strong bases, metallic sodium, potassium and lithium. At high temperatures, thermal decomposition of the agent may occur to produce the hazardous by-product, hydrogen fluoride.

HFC-236fa is utilized in the Ansul Incorporated Cleanguard™ line of fire extinguishers for aircraft use.

SUMMARY

There are several environmentally friendly clean agent halon alternatives available for fire protection use. When compared to Halon 1211 and 1301, these agents have significantly reduced ozone depletion potential values, global warming potential values and atmospheric lifetimes. While there may be some debate about the effectiveness of these agents when compared side-by-side to halons, the end result is still a clean alternative extinguishant for sensitive commodities that better addresses long term environmental concerns.

1. U.S. Environmental Protection Agency Significant New Alternatives Policy website. http://www.epa.gov/ozone/snap
2. NFPA 2001, "Standard on Clean Agent Fire Extinguishing Systems", 2000 edition, National Fire Protection Association.
3. "Direct Halon Replacement Agents and Systems", Phillip J. DiNenno, Fire Protection Handbook, 18th edition, National Fire Protection Association.
4. U.S. Environmental Protection Agency Clean Air Act website. http://www.epa.gov/oar/caa
5. U.S. Environmental Protection Agency Terminology Reference website. http://oaspub.epa.gov/trs

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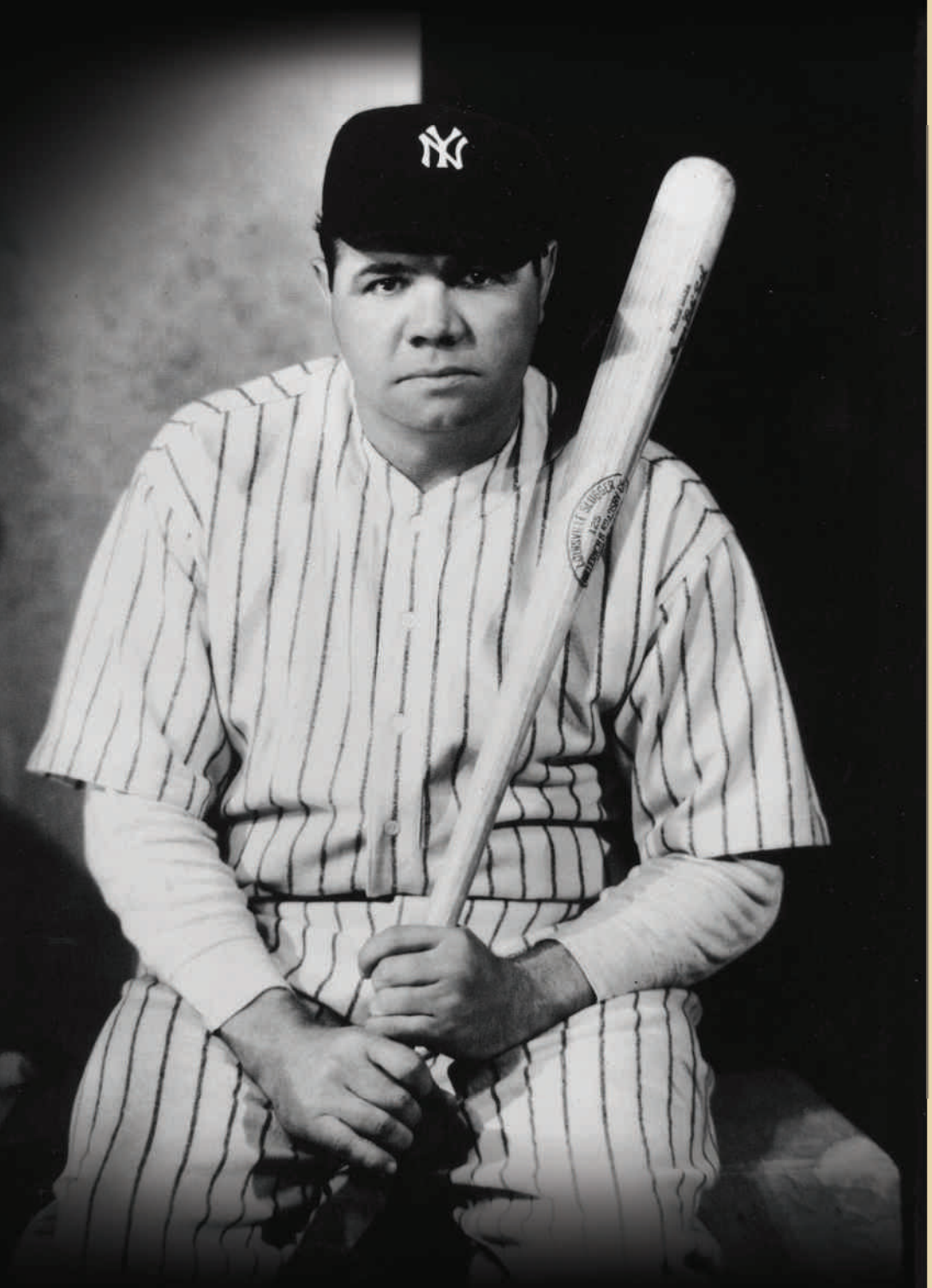

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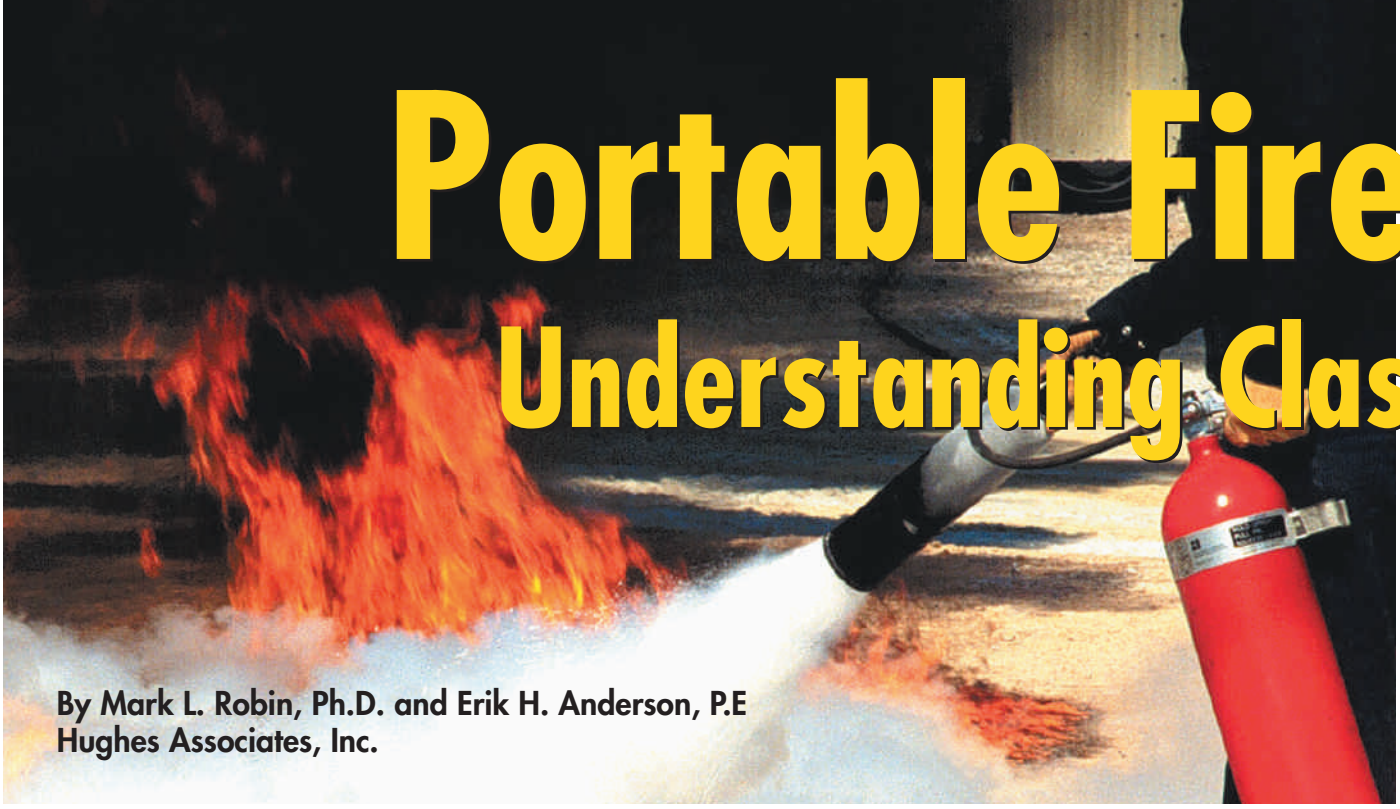

Portable Fire Understanding Classi

By Mark L. Robin, Ph.D. and Erik H. Anderson, P.E
Hughes Associates, Inc.

Pic courtesy of Ansul Inc.

PORTABLE FIRE EXTINGUISHERS protect billions of dollars worth of assets worldwide. Key to the selection of a suitable unit is an understanding of the classification and rating systems which have been established for portable extinguishers. In this article we discuss the classification and rating systems employed by ISO and NFPA for portable extinguishers.

PORTABLE EXTINGUISHER STANDARDS

The requirements intended to ensure the reliability and performance of portable extinguishers having a charged mass of 25 kg or less are specified in ISO 7165: 1999, *Fire Fighting – Portable fire extinguishers – Performance and construction.* ISO 11601:1999, *Wheeled fire extinguishers – Performance and construction,* is applicable to wheeled fire extinguishers having a charged mass of greater than 25 kg but not more than 450 kg. In addition to these basic standards, the following standards are applicable to the different types of portable fire extinguishers:

- ISO 5923: Carbon dioxide
- ISO 7202: Powder
- ISO 7203 (parts 1-3): Foam concentrates
- ISO 14520 (all parts): Clean agents

In the United States (and other countries adopting NFPA standards), NFPA 10, *Standard for Portable Fire Extinguishers,* specifies the requirements for portable extinguishers. Performance standards applicable to the different types of portable extinguishers include:

- ANSI/UL 154: Carbon dioxide
- ANSI/UL 299: Dry chemical
- ANSI/UL 626: Water
- ANSI/UL 1093: Halon
- ANSI/UL 8: Film-forming foam
- ANSI/UL 2129: Halocarbon

CLASSIFICATION OF FIRES

Fires are classified according to the nature of the fuel undergoing combustion. As seen in Table 1, ISO 3941, *Classification of fires,* and NFPA 10 employ different fire classification systems. ISO 3941 defines fires involving liquids and gases as Class B and Class C fires, respectively. NFPA 10 groups liquid and gaseous fuel fires together as Class B fires. NFPA 10 defines Class C fires as those involving energized electrical equipment. ISO 3941does not have a specific classification for energized electrical equipment. Both systems define Class D fires as those involving burning metals. Fires involving cooking oils and fats are classified as Class K fires under NFPA 10; a similar classification does not exist in ISO 3941 or ISO 7165. Several national standards, e.g., British Standard BS7937, have designated fires involving cooking oils and fats as Class F fires, and it is expected that future editions of ISO 3941 and ISO 7165 will include this classification.

Table 1: Classification of Fires

Description of Fire	Classification	
	ISO 3941: 1977	NFPA 10: 2002
Fires involving ordinary combustible materials, e,g., wood, paper, fabrics	Class A	Class A
Fires involving flammable liquids	Class B	Class B
Fires involving flammable gases	Class C	Class B
Fires involving energized electrical equipment	–	Class C
Fires involving burning metals	Class D	Class D
Fires involving cooking oils and fats	–	Class K

PORTABLE EXTINGUISHER RATINGS

Portable extinguisher ratings are based upon the ability of the extinguishing unit to extinguish standard test fires. In addition to passing these extinguishment tests, the extinguishing unit itself must pass a number of "component" tests, including leakage tests, temperature cycling tests, impact tests, and material compatibility tests, designed to ensure proper operation of the extinguishing unit.

Class A Ratings. Under ISO 7165, Class A ratings are based upon the extinguishment of wood crib fires of a specified size, as detailed in Table 2. Ignition of the wood crib is accomplished by employing an ignition pan (of the size indicated in Table 2), charged with heptane. The heptane fuel is ignited, and the crib is allowed to burn until its mass is reduced to 55% of its original mass before suppression is attempted. A Class A rating is achieved by extinguishing two out of three fires of the same size.

Extinguishers: fications and Ratings

Pic courtesy of Ansul Inc.

Table 2. ISO 7165 Wood Crib Tests

Class A Rating	Pieces of wood	Length[a] of pieces, mm	Arrangement, layers x pieces	Ignition pan size, mm	Heptane charge, L
1A	72	500	12 x 6	400 x 400 x 100	1.1
2A	112	635	16 x 7	535 x 535 x 100	2.0
3A	144	735	18 x 8	635 x 635 x 100	2.8
4A	180	800	20 x 9	700 x 700 x 100	3.4
6A	230	925	23 x 10	825 x 825 x 100	4.8
10A	324	1100	27 x 12	1000 x 1000 x 100	7.0
15A	450	1190	30 x 15	1090 x 1090 x 100	7.6
20A	561	1270	33 x 17	1170 x 1170 x 100	8.2

[a]cross section 39 mm x 39 mm

Table 3. ANSI/UL 711Wood Crib Fire Tests

Class A Rating	Pieces of wood	Dimensions of wood pieces, mm	Layer x pieces	Ignition pan size, mm	Heptane Charge, L
1-A	50	508 x 38 x 38	10 x 5	533 x 533 x 102	0.95
2-A	78	651 x 38 x 38	13 x 6	533 x 533 x 102	1.90
3-A	98	781 x 38 x 38	14 x 7	686 x 686 x 102	2.85
4-A	120	848 x 38 x 38	15 x 8	686 x 686 x 102	3.8
6-A	153	848 x 38 x 38	17 x 9	813 x 813 x 102	5.70
10-A	209	1207 x 38 x 38	19 x 11	965 x 965 x 305	8.5
20-A	160	1581 x 38 x 89	10 x 15 on edge; 1 top layer of 10 flat	1372 x 1372 x 305	17.00
30-A	192	1895 x 38 x 89	10 x 18 on edge; 1 top layer of 12 flat	1676 x 1676 x 305	22.70
40-A	224	2213 x 38 x 89	10 x 21 on edge; 1 top layer of 14 flat	1930 x 1930 x 305	37.90

NFPA 10 requires ratings to be determined according to ANSI/UL 711, *Standard for Rating and Fire Testing of Fire Extinguishers.* Required tests include wood crib fires for all Class A ratings, and wood panel and excelsior (a packing material consisting of finely shredded wood strands) fire tests for ratings of 6-A and below. A Class A rating is achieved by extinguishing two successive fires of the same size. The conditions of the ANSI/UL 711 wood crib test are detailed in Table 3. For ratings up to and including 4-A, the wood crib is allowed to burn until stick members in the top three rows have been reduced to diameters of 19-25 mm before attacking the fire with the extinguisher; for ratings over 4-A, the crib is allowed to burn until stick members in the top three rows have been reduced to diameters of ½ to ⅓ of their original dimensions before attacking the fire with the extinguisher. Table 4 shows the conditions of the wood panel test and excelsior fire test. The wood panel fire test employs a vertical panel, with excelsior placed against the base of the wood panel. Ignition is accomplished with fuel oil spread over the entire panel surface. The extinguisher is applied 5 seconds after the horizontal furring strips at the lower portion of the test panel fall away. In the excelsior test, a one foot deep pile of excelsior is ignited with a small fuse of heptane. The fire is attacked at the time the flames reach the center of the excelsior bed.

Class B Ratings. Under ISO 7165, Class B ratings are based upon the ability of the extinguisher to extinguish fires of heptane in a circular pan, as detailed in Table 5. The fuel is ignited and the fire allowed a 60 second preburn before being attacked with the extinguisher.

Class B ratings determined under ANSI/UL 711 are also based upon the extinguishment of heptane pan fires. Details of the test conditions are shown in Table 6. Class B fire tests are performed on heptane fires in square metal pans, with a 60 second preburn before being attacked with the extinguisher.

Class C Ratings. There are no test requirements in ISO 7165 for the performance of extinguishers against Class C (gaseous fuel) fires; only Class B or Class AB powder extinguishers are suitable for Class C fires. Class C ratings have no numerical components associated with them.

Under ANSI/UL 711, there are no fire tests for fire extinguisher performance against Class C (energized electrical fires). However, the electrical conductivity of the extinguishing agent is tested to

Table 4. ANSI/UL 711 Wood panel and excelsior fire tests

Class A Rating	Wood Panel Test			Excelsior Test	
	Test Panel size, m	No. 2 fuel oil, L	Excelsior, kg	Test area, m	Excelsior, kg
1-A	2.45 x 2.45	3.80	4.55	0.85 x 1.75	2.70
2-A	3.05 x 3.05	7.55	9.05	1.20 x 2.45	5.45
3-A	3.65 x 3.65	11.35	13.60	1.50 x 3.00	8.15
4-A	4.25 x 4.25	15.15	18.15	1.85 x 3.25	10.90
6-A	5.20 x 5.20	22.70	27.20	2.10 x 3.95	16.35

Table 5. ISO 7165 Heptane Pan Fire Tests

Class B Rating	Volume of liquid, Liters[a]	Test Fire Tray Dimensions, mm			Surface area of fire, m^2	Minimum Discharge Time, s
		Diameter	Internal depth	Wall thickness		
8B	8	570	150	2.0	0.25	–
13B	13	720	150	2.0	0.41	–
21B	21	920	150	2.0	0.66	8
34B	34	1170	150	2.5	1.07	8
55B	55	1480	150	2.5	1.73	9
70B	70	1670	150	2.5	2.20	9
89B	89	1890	200	2.5	2.80	9
113B	113	2130	200	2.5	3.55	12
144B	144	2400	200	2.5	4.52	15
183B	183	2710	200	2.5	5.75	15
233B	233	3000	200	2.5	7.32	15

[a]⅓ water and ⅔ heptane

Table 6. ANSI/UL 711 Heptane Pan Fire Tests

Class B Rating	Pan Size, m^2	Commercial Grade Heptane Used, Liters	Minimum Effective Discharge Time, seconds
1-B	0.25	12.5	8
2-B	0.45	23.5	8
5-B	1.15	58.5	8
10-B	2.30	117.0	8
20-B	4.65	245.0	8
30-B	6.95	360.0	11
40-B	9.30	475.0	13
60-B	13.95	720.0	17
80-B	18.60	950.0	20
120-B	27.85	1420.0	26
160-B	37.20	1895.0	31
240-B	55.75	2840.0	40
320-B	74.30	3790.0	48
480-B	111.50	5680.0	63
640-B	148.60	7570.0	75

ensure the agent is electrically non-conducting. Class C ratings have no numerical components associated with them.

Class D Ratings. Class D ratings are based on combustible metal fire tests. Under ISO 7165, these include magnesium and magnesium alloy fires, metal powder fires, shallow liquid metal fires of sodium, spill fires, melting pan fires, and simulated casting fires. Class D ratings have no numerical components associated with them. The type of metal for which the extinguisher is applicable must be indicated on the extinguisher nameplate.

ANSI/UL 711 Class D ratings are based upon magnesium chip fire tests and sodium, potassium and sodium-potassium alloy fire tests; Class D ratings under ANSI/UL 711 have no numerical components associated with them. The type of metal for which the extinguisher is applicable must be indicated on the extinguisher nameplate.

Class K Ratings. Class K ratings are based upon the extinguishment of vegetable oil fires in a commercial deep fat fryers, having a nominal 36 kg capacity The extinguisher must extinguish the fire in the fryer completely, prohibit reignition for 20 minutes, and not splash flaming oil outside the fryer. There are no numerical components for Class K ratings as the fire extinguishing capability is determined only for a single size fire source.

Table 7. Portable Extinguisher Selection

Fire Classification	Suitable Portable Extinguishers
Class A	Water-based, dry chemical, wet chemical, halogenated
Class B	AFFF, FFFP, dry chemical, CO_2, halogenated
Class C (flamm. gas)	AFFF, FFFP, dry chemical, CO_2, halogenated
Class C (electrical)	CO_2, powder, halogenated
Class D	Special powder
Class K	Wet chemical

TYPES OF PORTABLE EXTINGUISHERS

Table 7 lists the different types of portable fire extinguishers suitable for a given fire classification. Water-based extinguishers include water, water spray, water mist, aqueous film forming foam (AFFF), film-forming fluoroprotein (FFFP), and loaded stream (water-based with an alkali metal salt as freezing point depressant) extinguishers. Water-based extinguishers are suitable for use on Class A fires, and foam based fire extinguishers are suitable for both Class A and Class B fires.

Multipurpose dry powder (ammonium phosphate) is suitable for Class A, B and C (electrical) fires. Ordinary dry chemical extinguishers employing sodium bicarbonate are effective on Class B and Class C (electrical) fires, as are dry powder extinguishers employing Purple K (potassium bicarbonate).

Class D extinguishers typically employ sodium chloride or copper-based dry powders. Class K extinguishers contain a "wet chemcial" typically based on citric or lactic acid, which has the effect of turning cooking oil into a soap-like substance, and smothering the fire.

CONCLUSION

In this article, we have discussed the classification and rating methodology for fire extinguishers. Whether or not fire extinguishers are required in a given building or occupancy is determined by the local building and fire codes. Many countries publish guides or codes of practice relating to the use of portable extinguishers, and reference should be made to these for the proper selection and placement of portable extinguishers. For example, in the United States (and other countries adopting NFPA standards), NFPA 10 specifies the requirements for the size, number and location of fire extinguishers. Under NFPA 10 the distribution of fire extinguishers depends upon several factors, including the "hazard classification" of the area being protected (light, ordinary, or extra), the size of the area, and the travel distance to the nearest extinguisher. Details regarding the placement of portable extinguishers will be discussed in a future article.

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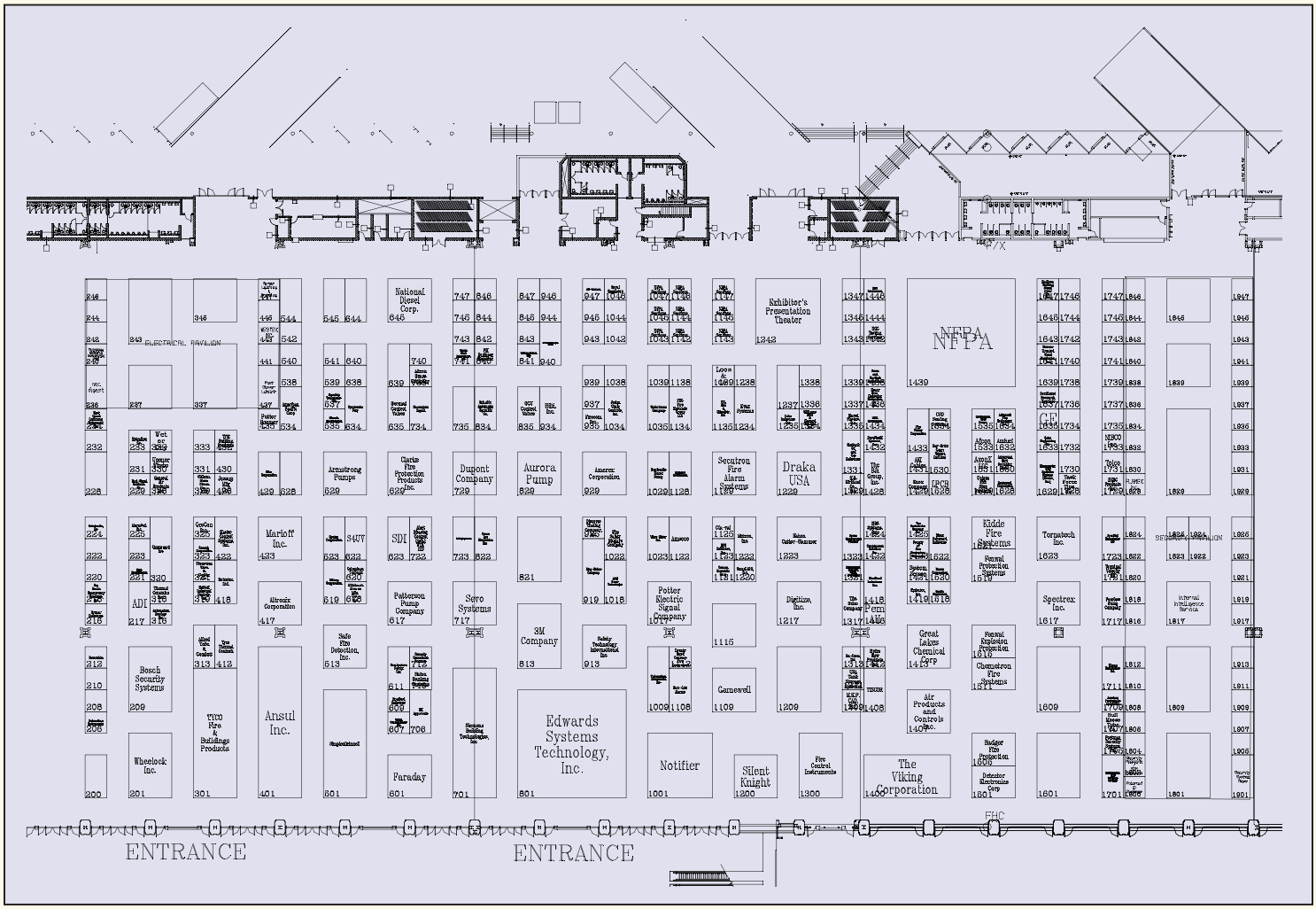
NFPA World Safety Salt Palace Convention



Company, Booth #	Products Description
3M 801	3M Novec 1230 Fire Protection
5 Elem Fire Hose Company, Ltd 329	Fire hose couplings, nozzles,"Y" connectors and fire-proof paint.
Abesco, LLC 1339	Firestop caulks, intumescent collars, wrap strips, cable transits
Active Safety Corporation 930	Exit signs, low-level egress systems.
ADI 217	Low-Voltage distributor, alarm, sound, communications and structured cabling
Advanced Fire Technology, Inc. 1634	Rocket technology used in suppression and post-extinguishment measures
AEI Cables 1431	2-hour fire-resistive MI cable
AES – Intellinet 947	2-way RF alarm communication systems
AFCON 1533	Fire sprinkler pipe hangers and sway braces
Air Products and Controls 1407	Air duct smoke detectors
Akron Brass Company 738	Fire fighting equipment: nozzles, monitors, turrets, valves and foam equipment
Alarmsaf, Inc. 225	Power supplies up to 16 amps, ADA/NAC power boosters to 6 amps
Alert Disaster Control 722	3M foam, Emergency response & integrated risk management solutions
Allied Tube & Conduit 313	
Altronix Corporation 417	Fire alarms, programmable annual and one-shot timers, custom design products
Amerex Corporation 913	Fire extinguishers, fire systems, service equipment
American Fire Sprinkler Association 1630	Association Information
American Pacific Corp. 534	Clean fire extinguishing agents
American Pyrotechnics Assoc. 1224	Educational videos and pamphlets
AMFUEL Sales 1632	Fuel & water storage bladders
Amseco 1122	Fire alarm signaling devices
Ansul Inc. 401	Dry chemical, foam and clean extinguishing agents
Arcom/MasterSpec Specifications 843	Architectural design and specification software
ARFF 223	Aircraft Rescue Firefighting Working Group
Armstrong Pumps 529	Fire pump systems
Arrow Tank & Engineering Co. 719	Bladder tank proportioning system
ASCO Power Technologies 1018	Fire pump controllers
Automatic Fire Alarm Association 220	Association Information
Automation Displays Inc. 316	Alarm annunciators, smoke control panels, door monitoring systems

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Company, Booth #	Products Description
AxonX LLC 1531	Vison-based fire/smoke/motion detection
Badger Fire Protection 1505	Industrial fire extinguishers, fire suppression
Bermad Control Valves 635	Control valves
Big Beam Emergency Systems, Inc. 218	Emergency Lighting & Exit Signs
Blazemaster Fire Sprinkle 1629	fire sprinkler systems
Bosch Security System 209	Fire, intrusion, access controls, CCTV
Bradford Industries 609	PyroBlok – industrial & architectural flame barriers
Brimar Industries 216	Safety & identification signs to comply with NFPA
BuildingReports.com 723	Mobile reporting and web-based reporting
Bull Moose Tube Company 813	Sprinkler pipe
Ceco Door Products 208	Lighted egress marking systems
Cementex Products 333	Insultated tools & personal protective equipment
Center for Disease Control And Prevention 539	
Chemetron Fire Systems 1511	Fire suppression systems
Chemguard Inc. 320	Foam concentrates and foam systems
Clarke Fire Protection Products 629	Diesel engines for fire protection systems
Claval 1125	Fire pump relief valves
Columbian TecTank 620	Fire protection water storage tanks
Comark Corporation 323	UL864 recognized computers, displays & peripherals
Combustion Safety, Inc. 611	Engineering services, testing, inspections, training
Combustion Science & Engineering, Inc. 831	
Containment Solutions Inc. 1422	Storage/handling for flammable or combustible liquids
Cornell Communications Inc. 607	Rescue assistance, emergency call systems, pocket paging
CSD Sealing Systems 1534	Fire-stop materials.
Cummins NPower 429	Diesel engines for fire pumps
Day-Brite Capri Omega Lighting 1530	Firedome downlight, egress equipment
DecoShield Systems, Inc. 1432	Sprinkler piping, plumbing, hydronics, cable & conduit concealment systems
Detector Electronics Corp 1501	Flame and Gas detection solutions
Digitize, Inc. 1217	Alarm monitoring equipment
Discover Trading Company 925	Valves, pipes, fittings
Dis-Cover, Inc. 1313	Fire extinguishing products and services
Doringer Cold Saws 712	Metal cutting saws
Draka USA Corp. 1229	Cables
DuPont 823	FE clean agent fire extinguishants
East Coast Lightning Equipment 234	Lightning protection systems
Eaton/Cutler Hammer 1223	Fire pump controllers
Edwards Manufacturing 535	Foam and water mist pumps
Edwards Systems Technology 901	Integrated fire and security systems
Egress Marking Systems LLC 200	Floor proximity path marking systems
Elkhart Brass Mfg. Co., Inc. 618	Fire fighting products
Engineered Systems 1611	Publication
Evax Systems 1234	Voice evacuation panels
Faraday 601	Notification appliances, fire alarms, detection products
FDL-USA 1639	Firefly line of passive firestop materials (textile)
Fenwal Explostion Protection 1515	Explosion protection
Fenwal Protection Systems 1519	Protection systems
Fike Corporation 429	Fire suppression, fire detection, explosion protection
Fire Control Instruments 1300	Fire alarm control panels
Fire Protection Systems Corrosion Mgmt, Inc. 717	Corrosion Management Products
Fire Protection Technologies 624	Flammadur & Geaguello fire stops
Fire Safety Displays Co. 1022	Evacuation displays, identification signs

Company, Booth #	Products Description
Fire Sentry Corporation 1433	Electro-optical fire detectors and visual smoke detection
Fireblankets Inc 640	Kitchen fire blankets, fire rescue blankets, welding/safety blankets
Firecom, Inc. 935	Fire alarm systems
Fire-Lite Alarms 1108	Fire alarm systems
FirePack Oil and Gas Industries 1331	Pyrogen, fire caddy
Firetrace International 1128	Fire detection and suppression for enclosures
FLAMEX Inc. 829	Spark detection and suppression systems
FlexHead Industries 1418	Flexible fire sprinkler connections
FM Approvals 706	Certification services
FMG Fire Materials Group 1134	testing and inspection services
FPE Software, Inc. 1123	Computer software
Gamewell 1109	Safety systems and fire alarm control panels
GAST MFG Inc. 331	Air Compressors for dry sprinkler pumps
GE Global Asset Protection Services 1635	Loss prevention web tools
Gemini Scientific Corp. 1121	Smoke Detector Testers
General Air Products 328	Fire protection air compressors
Gentex Corporation 929	Signaling devices and smoke detectors for fire alarms
Great Lakes Chemical Corp. 1413	Fire extinguishing agent
GreCon, Inc. 325	Spark detection and extinguishing systems
Grice Engineering Inc. 1633	The Soffi-steel system
Guangxi Materials General Group Corp. 1039	Fire Hoses & Fire Extinguishers
H.R. Kirkland Co., Inc. 1329	Fire alarm annunciators, smoke control panels, graphic maps
Halon Banking Systems 710	Halon & Halon Recycling
Harger Lighting & Grounding 447	Lighting protection and grounding equipment
Harrington Signal 734	Smoke alarm products and systems
Harvel Plastics, Inc. 1335	Harvel Blazemaster CPUC Fire Sprinkler Piping Products
Heary Bros. Lightning Protection Co., Inc. 1436	Lightning protection equipment
HERC Products Inc. 1529	Chemical cleaning service
Hilti, Inc. 934	Firestop products
Home Fire Sprinkler Coalition 1042	
Home Safeguard Industries 1522	Testing and maintenance equipment for fire alarms
Hoover Treated Wood Products 1641	Fire-retardant-treated lumber. Pyro-guard interior & exterior.
Houston Wire & Cable Co. 321	Electrical wire and lumber
HRS Systems, Inc. 1424	Fire protection software
Hubbell Industrial Controls, Inc. 319	Fire pump controls
Hydratec, Inc. 1419	Sprinkler system design software
Hydro Flow Products, Inc. 1412	Pump testing equipment
IAPMO 1643 & 430	Association Information
Industrial Hygine News and Pollution Equipment News 232	Publication
Internal Intelligence Service 817	CCTV, guard services
International Association of Arson Investigators 540	Association Information
International Code Council 1535	Codes, certification, training, and related products
International Fire Resistant System 937	Fire-resistant coating
International Municipal Signal Association 1321	Information and training
IPC Resistors 1238	Ground Fault protection systems
Jessup Mfg. Co. 428	Photoluminescent egress systems
Jones and Bartlett Publishers 1438	Training and safety education
Joslyn Clarke Controls, Inc. 1034	Fire pump controls
Keltron Corporation 519	Life safety event management systems
Kidde Fire Systems 1521	Detection systems
King-Fisher Company 919	Radio fire alarm, personal alerting systems
Knox Company 1429	Key boxes, FPC caps, key source

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Salt Palace Convention Center, May 23-25, 2004

Company, Booth #	Products Description
KO Instruments 341	CBA-1000 circuit breaker analyzer
Loos & Co. 1139	Wire rope/cable bracing system
LPCB/BRE 1528	Approval and certification
M.E.P. CAD, Inc. 1309	Design systems software
Marioff Inc. 423	Water fire mist protection
Master Control Systems 422	Fire pump controllers
Maxi-Signal Products Co. 229	Signals, lighting, safety equipment
McKeon Rolling Steel Door Company 1647	AutoSet fire door operator, Rolling steel fire doors
Mechanical Ingenuity Corp. 740	Commercial Door Operator Upgrade to UL325; Local Alarm Control Response
MEDC International 1434	Fire, gas and communications systems
Merit Manufacturing, (Anvil, Intl) 221	Welding Outlets & Adjustable Drop Nipples
Metraflex 233	Fire sprinkler system designs
Milliken Protective Fabrics 436	
Mircom Technologies 1029	Alarm systems, annunciators, detectors, monitoring equipment, signaling systems
Modeltech International 737	Hazard House
National Alarm Association 945	Association Information
National Diesel Corp. 928	Fire pump diesel engines
National Fallen Firefighters Foundation 1044	Association Information
nec digest 236	Publication
NFPA 1439	Organization: codes and standards
NGC Testing Services 1442	Testing services
NIBCO Inc. 809	Valves, pipe hangers, supports, seismic bracing
No-Burn 1237	No-Burn fire retardant and reactancts
Notifier 1001	Fire alarm control panels
OCV Control Valves 835	Control valves
Omega Point Laboratories, Inc. 741	Building materials testing
OmniCADD, Inc. 1220	CAD systems for sprinkler system design
OnSite Software Inc. 1518	Life Safety Inspector—Inspection/Service Software
Patterson Pump Company 617	Stationary fire pumps
Peerless Pump Company 1209	Custom pump packages
Pem All 1416	Clean Agent Systems, Dry Chemical Systems, Panels & Detection
Pioneering Technologic 1038	Safe-T-Element, Portable Safe-T-Element
PM Engineer Magazine 840	Magazine
Polaroid ID Systems 908	Commercial Digital Identification Systems
Post Glover Lifelink 437	Isolated Power Systems, Operating Room Equipment
Potter Electric Signal Co. 1017	Fire protection security
Potter Roemer 435	Standpipe and hose equipment
Prescolite 1312	Fire Shield fire-resistant recessed downlights
Public Venue Security 743	Magazine
RBI/Consulting-Specifying Engineer 940	Magazine
Rectorseal 1628	Firestop
REHAU 735	PEX pipe and fittings for residential fire protection
Reliable Automatic Sprinkler 834	Fire sprinklers and valves
RemTec International 1020	Halon recycler
Retrotec Ltd. 418	Door fan testing equipment
Robotronics, Inc. 224	Fire safety/injury protection educational products
Rockbestos-Suprenant Cable Corp. 841	2-hour fire-rated cable
Rolf Jensen & Associates 1428	Fire Protection Training Products
Royal Quickstop 1046	Firestop products
SAFE Fire Detection Inc. 513	Air sampling fire detectors
Safety Technology International 907	Stopperline
Sako & Associates, Inc. 1430	Consulting Firm
SDi 1214	Smoke and heat detectors testing
Security Magazine/SDM Magazine 1611	Publication
Security Systems New 220	Publication
Security World International	Publication
Secutron Fire Alarm Systems 1129	Fire alarm control panels
Sensor Electronics 1613	Fire Suppression Equipment, Aero-K Fire Suppression, Gas Detect

Company, Booth #	Products Description
Sevo Systems 910	Clean Agent Cylinders Featuring Novec 1230
Shanghai Special Tex. Co. Ltd. 1036	Fire Prevention & Protection Fiberglass Fabrics
Shurjoint Piping Products 623	Grooved, threaded and hole-cut piping components
Siemens Building Technologies 701	Fire detection solutions
Signalink Technologies Inc. 537	Fire-link and smoke alarm link
Silent Knight 1200	Fire alarm control panels
Simplex Grinnell 501	fire alarm systems, detection, suppression systems
Society of Fire Protection Engineers 1423	Association information
Southwest Research Institute 1637	Fire testing and engineering services
Space Age Electronics 822	Annunciators/Notification/Cabinets/Relay
Spears Manufacturing Company 1323	Fire sprinklers
Specified Technologies Inc. 1308	Firestop products
Spectrex Inc. 1617	Gas and flame detectors
Spectronics Corp. 634	Fire alarm control
Subsurface Instruments 206	Underground & Underwater Magnetic & Pipe and Cable Locators
System Sensor 1421	Smoke detection and notification devices
Talco Industries Inc. 1235	Residential fire systems
Task Force Tips, Inc. 912	Fire fighting equipment
Technology Research Corporation 240	Electrical safety products, surge strips, extension cords
Terminal Velocity FM 1343	Evacuation Signs, Evacuation Plan Software, Facilities Management
Telex Communications 943	Pro-Announce Paging & Life-Safety Voice Evacuation System
The Bilco Company 1317	specialty access products
The Phoenix Society for Burn Survivors 638	
The Protectowire Company, Inc. 1425	Linear heat detection systems
The Viking Corporation 1400	Fire protection equipment
Thermal Ceramics Inc. 318	Insulation
Tiscor 1408	Fire and safety mobile software
Tolco 811	Seismic bracing, hangers, supports
Tornatech, Inc. 541	Fire pump controllers
TVA Fire & Lifesafety Inc. 1135	Engineering, consulting, loss control, project management
TVM Building Products 432	Firestop & Draft Stop Caulks
Twenty First Century Fire Equipment 1112	Residential fire suppression system
TYCO 301	Fire protection products
TYCO Thermal Controls 412	
Underwriters Laboratories Inc. 1009	Safety information and services
University of Nevada Reno Fire Science Academy 625	
Uponor Wirsbo 330	Residential sprinkler systems
USA Tank Storage Systems 1311	Bolted Steel Tank, Tank Heaters, Tank Insulations
U.S. Department of Commerce 231	Salt Lake Export Assistance Center
Vibro-Meter, Inc. 1023	Fire detectors
Victaulic 1034	Couplings & Fittings, Sprinklers, Devices, CPVC
Viega NA 1213	Plumbing, Radiant Heating, & Snow Melting Systems
Watts/Ames Company 1035	Flow control products
Western Fire Chiefs Assoc./Uniform Fire Code Assoc. 1629	Books
Westex Inc. 443	Flame Resistant Material
Wet or Dry Tank Inspection 332	Inspections
Weyerhaeuser Composite Panels 1138	Fire-rated particle board, Fire-rated MDF
Wheelock Inc. 201	Fire alarm notifications
Williams Fire & Hazard Control 1334	Fire fighting supplies
Witzenmann 1338	Flexible Fire Protection Sprinkler Systems
WSA Fire Systems 525	Fire Alarm Control Panel, Smoke Detectors, Graphic Annunciators
Worcester Polytechnic Institute 1444	Fire Engineering Information
Workrite Uniforms 337	Leading Manufacturer of Flame Resistant Uniforms
Xerxes Corporation 1520	Fiberglass underground storage tanks
Zero International 1446	Intumescent firestop products

Fire Pump Signals

By Kenneth E. Isman, P.E.
Assistant Vice President of Engineering, National Fire Sprinkler Association

WHEN A FIRE PUMP IS RUNNING, or when something goes wrong with a fire pump system, a person needs to be informed so that action can be taken to investigate the situation and/or fix the problem so that the system can be returned to service. The fire pump controller may have some light, bell or whistle that indicates the situation, but since most fire pump rooms are not constantly attended, this indicator will not always notify a person of the fact that a situation has occurred that needs investigation. In addition to any indicator on the controller itself, certain critical signals need to be sent to constantly attended locations. This article will explore what signals need to be sent and the rules regarding these signals.

TERMINOLOGY

Before going too far on the subject of signals, the term "signal" needs to be defined along with the three different types of signals common in the fire protection industry: trouble signals, supervisory signals and alarm signals. The definitions of these terms are found in NFPA 72, *National Fire Alarm Code*. Unfortunately, NFPA 20, Standard for the Installation of stationary Pumps for Fire Protection, does not include a reference to NFPA 72 and sometimes uses conflicting terminology. In order to try and straighten out the confusion, this article will utilize the NFPA 72 terminology consistently and will not use the terms "alarm" and "signal" interchangeably as NFPA 20 does.

A signal is, "A status indication communicated by electrical or other means" (NFPA 72: 3.3.171). Note that a signal can be audible (bell, whistle or tone), visual (light, whether flashing or constant), or both, but there is no requirement that every signal be both audible and visual.

A trouble signal is, "A signal initiated by the fire alarm system or device indicative of a fault in a monitored circuit or component" (NFPA 72: 3.3.171.7). The trouble signal indicates when there is a problem with the electrical wiring or the electric device itself. Examples of trouble signals include where wiring has been cut or where a short circuit has occurred and a device is no longer operating properly. For a fire pump system, the correct action to take when a trouble signal arrives at a constantly attended location is to immediately investigate the reason for the signal. There is no reason to immediately contact the fire department. If the trouble can be corrected immediately, do so. If the trouble cannot be corrected immediately, an analysis of the situation needs to be made, and if the fire pump system will be out of service for a significant period of time (NFPA 72 mentions more than 8 hours as a guideline in section 8.2.7.4), the Impairment Procedures of NFPA 25 need to be followed until the trouble is fixed and the system is returned to normal service.

A supervisory signal is, "A signal indicating the need for action in connection with the supervision of guard tours, the fire suppression systems or equipment, or the maintenance features of related systems" (NFPA 72: 3.3.171.6). Examples of supervisory signals for fire pump systems include low water levels in suction tanks, low charge conditions of batteries for diesel driven pumps, and low temperatures in pump rooms. The correct action to take when a supervisory signal arrives at a constantly attended location is to immediately investigate the reason for the signal. There is no reason to immediately contact the fire department. If the trouble can be corrected immediately, do so. If the trouble cannot be corrected immediately, an analysis of the situation needs to be made, and if the fire pump system will be out of service for a significant period of time (NFPA 72 mentions more than 8 hours as a guideline in section 8.2.7.3), the Impairment Procedures of NFPA 25 need to be followed until the trouble is fixed and the system is returned to normal service.

An alarm signal is, "A signal indicating an emergency that requires immediate action, such as a signal indicative of fire" (NFPA 72: 3.3.171.1). An example of an alarm signal is the water flow alarm on a fire sprinkler system. The

A supervisory signal is, "A signal indicating the need for action in connection with the supervision of guard tours, the fire suppression systems or equipment, or the maintenance features of related systems" (NFPA 72: 3.3.171.6).

correct action to take when an alarm signal arrives at a constantly attended location is to contact the fire department immediately. Depending on the type of alarm signal, a person at the constantly attended location may, or may not, choose to send a person to investigate the source of the alarm prior to fire department arrival. This is a difficult subject to address directly due to the safety issues of potentially exposing investigative personnel to a fire.

PUMP RUNNING SIGNALS

So, now that we have defined the different types of signals, we need to ask a question regarding the pump running signal. "Is the pump running signal an alarm signal or a supervisory signal?" The answer is that the pump running signal should be treated as a supervisory signal, which is where NFPA 20 creates some of the confusion on the subject. NFPA 20 refers to the signal as the "pump running alarm" (see section 10.4.7.2 of NFPA 20 for example). But NFPA 20 does not intend for the term "alarm" to be applied in the same manner as defined by NFPA 72. It is less confusing, and more within the intent of both NFPA 20 and NFPA 72, to use the term "pump running signal" to refer to the notification of the fact that the pump has started.

Certainly the fact that the pump is running is important and needs to be investigated immediately. However, just because the pump is running does not mean that the fire department needs to be called. The pump is not the only piece of equipment in the fire protection system. If there is a fire, there should be a water flow alarm that also will send a signal to the constantly attended location. At that point in time, the fire department should be called. But there is no need to directly call the fire department for a pump running signal.

One of the reasons that the pump running signal should not be treated as an alarm signal is in the arrangement of the weekly pump test. Many building owners use an automatic timer to start the fire pump for its weekly churn test. The fire department and/or the monitoring station are not notified in advance of this test because the weekly timer starts the pump automatically. The intent of NFPA 20 and NFPA 72 is not to call the fire department each week to monitor the operation of the weekly pump churn test. Instead, the timer starts the pump and sends a supervisory signal to the constantly attended location. A person is then dispatched to monitor the pump and to shut it down at the end of the test if the controller is not equipped for automatic shutdown. But there is no need to call the fire department during this test, which would be required if the pump running signal was treated as an alarm signal.

NFPA 20 REQUIREMENTS

As stated earlier in this article, NFPA 20 does not reference NFPA 72 for the arrangement of the signals or the equipment used to send or receive the signals. This means that the pump controller and the equipment used to transmit the signals to a constantly attended location are not automatically required to follow NFPA 72. Instead, NFPA 20 requires the equipment to be installed in accordance with NFPA 70, *National Electrical Code*.

For electric motor driven fire pumps, NFPA 20 requires two signals to appear on the controller and four signals to be sent to a constantly attended location. All of these signals are considered supervisory signals given the definitions discussed earlier. All of these signals are required to be separate and distinct, meaning that they are not allowed to activate the same light or indicator. The individual receiving the signal needs to be able to distinguish which signal is coming in. The two signals that are required at the controller are: power available in all phases and phase reversal (see section 10.4.6). Interestingly, NFPA 20 requires both these alarms to be visible indicators, rather than allowing the broader spectrum of audible or visible devices.

The signals that are required to be sent to a constantly attended location for electric motor driven fire pumps are allowed to be either audible or visible. The four signals that are required to be sent to a constantly attended location are (see section 10.4.7):

1. Pump or motor running
2. Loss of phase
3. Phase reversal
4. Controller connected to alternate source (only where a transfer switch is installed)

For diesel engine driven fire pumps, the rules are similar. There are twelve signals that are required at the controller and three signals that are required to be sent to a constantly attended location. All of these signals are considered supervisory signals given the definitions discussed earlier. Of the twelve signals required at the controller, one must be a visible indicator that the controller is in the "on" or "automatic" position. The other eleven signals that are required at the controller are (see section 12.4.1.3):

1. Critically low oil pressure
2. High engine jacket coolant temperature
3. Failure of engine to automatically start
4. Shutdown from overspeed
5. Battery failure or missing battery (separate for each battery set)
6. Battery charger failure
7. Low air or hydraulic pressure (where water or air starting methods are used)
8. System overpressure (for variable speed controllers with pressure limiting controls)
9. ECM selector switch in alternate ECM position (for engines with ECM control only)
10. Fuel injection malfunction (for engines with ECM control only)
11. Low level fuel (when fuel tank is less than two-thirds full)

The eleven signals listed above are required to be both audible and visible. The audible signal is allowed to be common for all eleven signals and must be able to be heard above all of the noise

The intent of NFPA 20 and NFPA 72 is not to call the fire department each week to monitor the operation of the weekly pump churn test. Instead, the timer starts the pump and sends a supervisory signal to the constantly attended location.

in the pump room while the engine is running. The visible signals must be separate and unique so that a person looking at the controller can tell what the specific problem is.

The three signals that are required to be sent to a constantly attended location for a diesel engine driven fire pump are (see section 12.4.2.2):

1. Engine running
2. Controller turned to "off" or "manual" position
3. Any of the eleven signals at the controller that indicate a problem.

The signals sent to a constantly attended location are allowed to be audible or visible. Two of the signals are required to be separate and distinct, the engine running and the controller turned off. The other signal is allowed to be a single signal that lets the person monitoring the system know that there is something wrong. A person would need to be dispatched to the pump room to read the controller to find out exactly which of the situations is the current problem.

There are a number of situations that are not required to be monitored by NFPA 20, but would provide better performance and reliability if they were looked after. Since there is no requirement for these situations to be monitored, there is no requirement for whether they need to be provided with signals at the controller, or at a constantly attended location, or both. The situations that NFPA 20 recommends, but does not require signals are (see section A.5.23):

- Low pump room temperature
- Relief valve discharge
- Flowmeter left on, bypassing pump
- Water level in suction supply below normal
- Water level in suction supply near depletion
- Diesel fuel supply below normal
- Steam pressure below normal (steam driven pumps)

NFPA 72 REQUIREMENTS

Even though NFPA 72 is not referenced by NFPA 20, there are many times where NFPA 72 will become the governing document for fire pump signals. This will happen where a code or ordinance required that the fire protection system be supervised in accordance with NFPA 72 or where an engineer has specified the supervision of the entire fire protection system in accordance with NFPA 72. Note that this is different from a requirement for the valves to be supervised in accordance with NFPA 72. In order to bring in the requirements for fire pump equipment signals to be installed and monitored per NFPA 72, the code or ordinance needs to apply to the entire fire protection system, which includes the fire pump.

It should be noted that it is not the intent of NFPA 72 to require an entire alarm and detection system in a building just because the fire pump is being supervised in accordance with NFPA 72.

It should be noted that it is not the intent of NFPA 72 to require an entire alarm and detection system in a building just because the fire pump is being supervised in accordance with NFPA 72. The requirement for the building to have a complete fire alarm system is completely separate from the pump requirements and is generally handled by the building code.

NFPA 72 specifically comes out and states that the pump running signal is a supervisory signal, not an alarm signal (see section 3.3.88.2 and A.6.8.5.7.3 of NFPA 72). However, there is an appendix note in NFPA 72 (A.5.11) that allows the fire alarm to be activated when the pump starts running if the designer of the fire alarm system so desires. This may not be a good idea from the reasons stated at the beginning of the article, but if the designer has taken these testing issues into account, the system is allowed to be set up to sound the alarm upon starting of the fire pump.

NFPA 72 allows other fire protection system supervisory signals to be transmitted over the same path as the fire pump supervisory signals. If this is the case, there needs to be some method of making sure that the fire pump supervisory signals get priority if some other supervisory signal is trying to be sent at the same time. (See section 6.8.5.8 of NFPA 72.)

Another requirement from NFPA 72 that is often overlooked has to do with firefighter communication. Many buildings are required to have two-way telephone communication service for fire fighter use in the building. When this is the case, a telephone jack or telephone station is required to be placed in the pump room so that the incident commander can be in communication with the person monitoring the pump in that room. (See section 6.9.9.10 of NFPA 72.)

The following is a list of the supervisory conditions that can be required to be monitored (in addition to the requirements of NFPA 20) if the equipment exists on the installation. NFPA 72 does not directly require all of these items to be supervised, but lays out performance requirements in case they are specified by the designer to be supervised. This article only includes equipment common to fire pump installations. If a fire pump system has unusual equipment, it may require supervision even though not contained on the following list.

- Suction control valve supervised open (5.13.1)
- Discharge control valve supervised open (5.13.1)
- Bypass control valves supervised open (5.13.1)
- Test header valves supervised closed (5.13.1)
- Flow test meter bypass lines supervised closed (5.13.1)
- Water level in suction tank (5.13.3)
- Water level in break tank (5.13.3)
- Water temperature in suction tank (5.14.4)
- Water temperature in break tank (5.14.4)
- Temperature in pump room (5.13.5)

CONCLUSION

Hopefully this article has clarified some of the confusion surrounding the types of signals required for a fire pump installation and the appropriate actions to take when those signals arrive at the constantly attended location. This article has not attempted to define what a "constantly attended location" is and will leave that discussion to a future article.

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MCP, the fourth generation manual call point technology from KAC

By John Hadley of KAC

Pic courtesy of KAC

BREAK GLASS CALL POINTS have been the manual activation method for fire alarm systems since time immemorial, but it was in 1972 that KAC created the modern break glass call point. This was when the idea of scoring the reverse of the glass and using a protective film enabling it to fracture cleanly and safely was conceived. Having created this operating technology in the manual call point market, KAC has consolidated its position as market leader through a commitment to continuous product innovation, high quality manufacturing and outstanding customer service. The current World Series range of manual call points, introduced in 1997, is the third generation of devices from KAC which incorporates the original benefits into an integrated range of devices and accessories.

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Our latest development, the new MCP range, provides major advances in installation efficiency, full compliance and flexibility with the latest standards whilst also offering further benefits for the installer, the specifier, the fire system integrator and the end user.

The new range reflects the requests made by our customers, specifiers and OEM partners. Every change and improvement in the MCP is there because it has been asked for by the very people who specify, install and use the product.

Although the new MCP range offers many innovative new features, the range has also been designed to be backward compatible with our current range of accessories and can therefore be used as a transparent upgrade or replacement in existing installations.

A NEW STANDARD

In 1989 an initial draft of a new European standard was circulated for technical comment and review. 12 years and several drafts later the finished standard EN54-11 was published. This standard sought to harmonise

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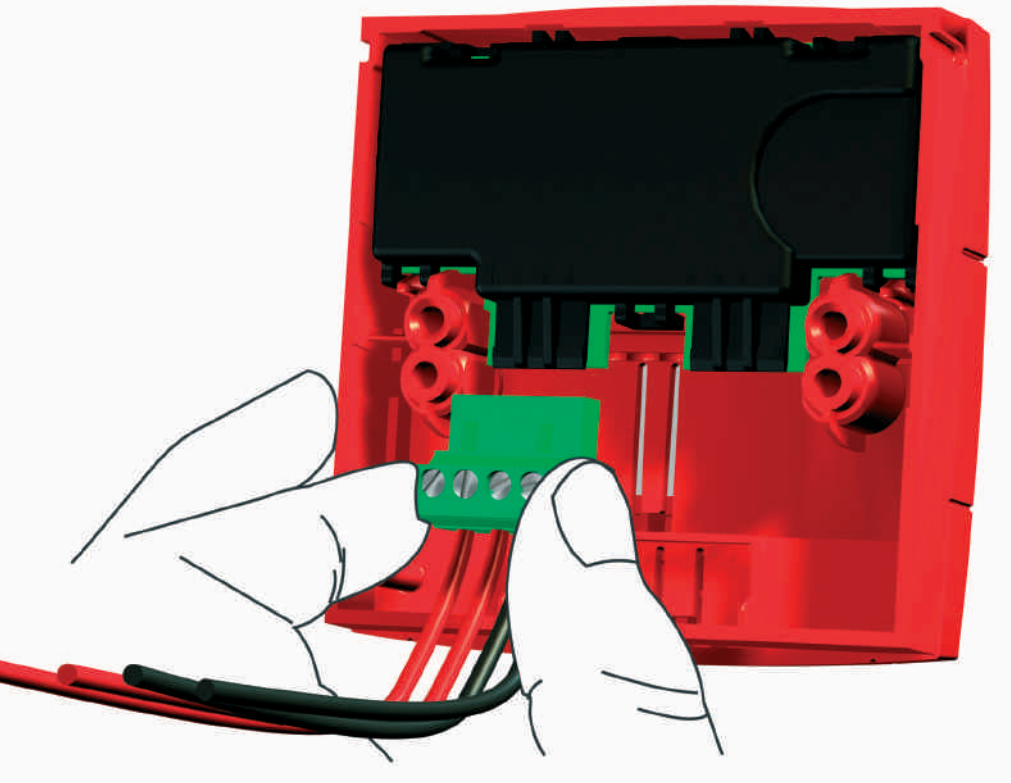

Pic courtesy of KAC

the many variations of manual activation devices and provide a common platform.

Traditionally, BS5839 Part 2:1983, the British Call Point Standard, stipulated that a frangible element (i.e. a break glass) should be used as the operating element for manual call points. This element should irreversibly fracture under pressure or impact. The introduction of EN54-11 brought about a change to the operating element by allowing a component that is glass or has the appearance of glass and which after receiving a blow or pressure as instructed is physically broken or visibly displaced. It further clarified that non re-settable is an element that needs to be replaced, whereas a re-settable can be returned to its original position without replacement.

Both of these standards ran side by side after the introduction of EN54-11 on 15th July 2001. However, although there has been some transfer to the new EN54-11 standard, take up has been slow. The adoption of EN54-11 should now move significantly quicker as the BS5839 Part 2:1983 standard was withdrawn on 1st September 2003.

It should be pointed out that this transition should move towards the EN54-11 markings becoming the standard across Europe, but it does not mean all operating elements will become re-settable, as both break glass and re-settable elements can still be used under this new standard. With BS5839 Part 2:1983 standard only just being phased out it is too early to predict which operating element will become more popular.

Both elements have characteristics that make them more or less suitable for specific applications. However, in our opinion, based upon 30 years of experience, glass still acts as a deterrent against misuse. Indeed, EN54-11 states that the frangible element should be glass or have the appearance of glass to be a deterrent against misuse.

As a customer-focussed manufacturer, we believe in providing customers with the choice of system components they need to provide the highest levels of safety and reliability in life-critical safety systems. To this end, the new MCP can be configured as either a break glass call point or a flexible element re-settable unit as required – and changing from one to the other in a matter of seconds without having to add additional component parts.

Providing the choice of element is one of the many decisions our customers will make during the system design phase and by providing both options, we give them the opportunity to make their decision free from any commercial pressures or constraints.

It should be pointed out that this transition should move towards the EN54-11 markings becoming the standard across Europe, but it does not mean all operating elements will become re-settable, as both break glass and re-settable elements can still be used under this new standard.

THE INSTALLATION SOLUTION – 'PLUG & PLAY'

The old adage, "time is money", was probably first coined by an electrical contractor on site and without doubt, like so many other electrical installations, the pressure of time, and ultimately cost, are always at the forefront of any fire installation. Therefore, ease of installation has become of paramount importance to many installers of fire products.

Significantly reducing installation time was on of the major design parameters for the MCP range, a challenge that has been met through a completely new approach that sets the MCP range on a new level compared with every other manual call point on the market.

Pic courtesy of KAC

A new patented "plug and play" concept is at the heart of this new design, which utilises a special terminal block.

Upon initial installation, cabling can be terminated in to the MCP terminal block. The terminal block is then fitted with a simple continuity link, enabling the wiring of the fire alarm system to be tested for open, short circuit and earth fault without the manual call point unit itself in place. Therefore, the MCP product does not need to be fitted until the final commissioning stage. This is extremely advantageous because full installation before commissioning on a site where other services are still being installed can increase the likelihood of damage.

Upon final commissioning, the continuity link is removed from the "plug and play" terminal block, which is then plugged directly into the back of the MCP. Simple but effective: no re-termination required, no time wasted. The call point is now electrically installed; the call point body is screwed to the back box, the break glass or re-settable element is placed in position and secured. Installation complete

As a further advantage, the MCP terminal block provides a common interface for both intelligent and non-intelligent versions of the device.

EVEN MORE GREAT BENEFITS

The soft curve styling of the new MCP will complement today's architectural design trends without compromising the essential high visibility needed.

The MCP, whichever operating element is fitted, has a number of features that help to preserve the integrity of the overall system. If the lid is removed without isolating the device from the panel, the fire system will go into alarm.

The patented test, reset and lid release feature provides quick release of the manual call point lid whilst maintaining a robust design. This new design is operated by a single tool, which is also backwards compatible with the World Series and earlier generations of the KAC call point.

NEW PRODUCTS

The new MCP range also includes yet more innovative products.

MCP, the fourth generation manual call point technology from KAC

Pic courtesy of KAC

In addition to versions with the traditional dedicated normally open, normally closed and 470 ohm resistor models, the new MCP range also includes a new dual function product, which is a combined clean contact and resistor model, one providing a normally open clean contact system solution and the other a 470 Ohm resistor system solution. Changing from one to the other is a simple matter of mating the push fit "plug and play" terminal block with the correct terminal set, providing the installer with flexibility if the system requirements change at the last minute, potentially reducing stock holding requirements and enabling one product to be used in a variety of applications. By increasing the available PCB board space, a new addressable version of the MCP can be supplied complete with built-in isolation if required. This product provides short circuit protection to the loop without having to fit additional discrete loop isolators. By integrating short circuit protection into the MCP, fewer separate loop components have to be installed, again helping to reduce installation time without jeopardising the integrity of the overall system.

However innovative the MCP itself, we can guarantee that one thing has not changed: our commitment to quality and service. Both the break glass and resetable versions are third party approved to EN54-11, they are fully compatible with all existing KAC accessories such as the surface mount box, Patress and terminal trays and they readily fit most established patterns of electrical outlet boxes in the world. Adding in our well-established customer branding services, high quality manufacturing, outstanding service ethos and technical support functions makes the MCP an even more attractive replacement for our World Service range, itself the undisputed market leader.

DIFFICULT, BUT NOT IMPOSSIBLE.

KAC

THE NEW MCP RANGE

A new innovative range from KAC which once again sets a new level in Manual Call Point technology, whilst retaining all the great features of the existing 'World Series' range. New features include : -

Plug & Play
Plug in terminations bring faster wiring and hassle free installation.

Flex-Ability
The new design allows easy conversion from break glass element to flexible element and vice versa, without the need of additional parts.

EN54 Compliant
The new MCP range is fully EN54 compliant in any format.

Integrated Design
A fully integrated design provides the complete OEM product solution.

Great Looks
Modern stylish design provides greater aesthetical appeal.

Compatibility
The new MCP range products are fully compatible with existing accessories and the new test key will operate both the MCP and World Series products.

GET THE POINT

For More Information Call

KAC Alarm Company Limited, 15-19 Trescott Road, Smallwood, Redditch, B98 7AH, England.
Tel: +44 (0) 1527 406655 Fax: +44 (0) 1527 406677,
e-mail: marketing@kac.co.uk, website: www.kac.co.uk

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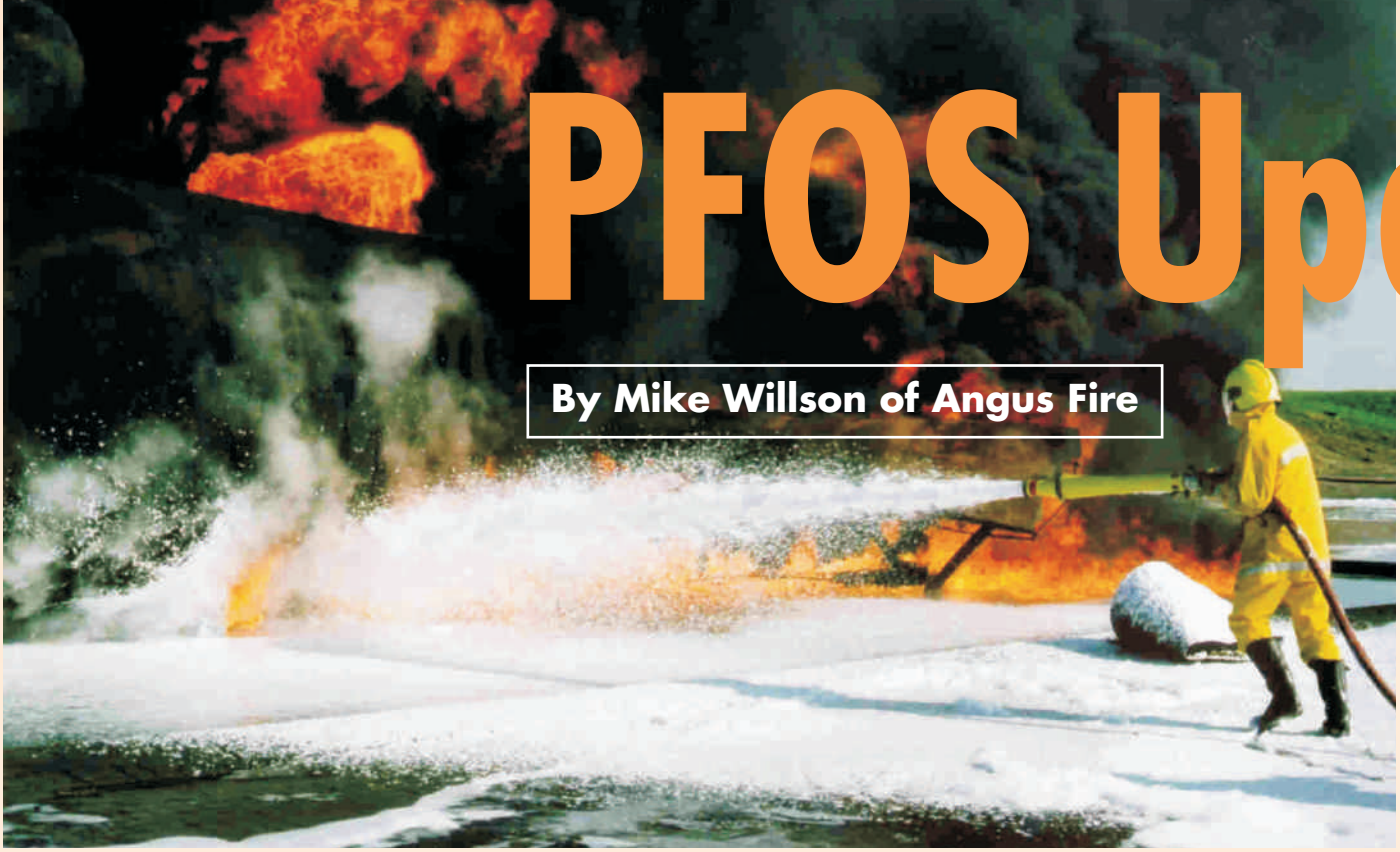

PFOS Upd

By Mike Willson of Angus Fire

Syndura the modern F3 Fluorine-Free Foam in action for aviation applications.

Ed – Following on from his article in IFP Issue 17, here Mike Willson completes his PFOS Update. In this second part he will be looking at Telomer based products, Flurorine free products, modern product scores, hydrocarbon tank protection plus much more. To review part 1 logon to www.ifpmag.com

WHAT IS THE RIGHT FOAM?

What you need is the right foam(s) to protect your hazards through your specific application devices to ensure you are getting good value for money. This does not mean the cheapest foam as already described.

To determine this we need to start with deciding whether synthetic based or natural protein based products offer most benefits for your particular applications and facility. Choosing a manufacturer who produces foam by both methods is the most reliable way to get unbiased advise on this. An alternative is to contact a well known independent Consultant who specialises in this area, and works extensively in your particular sector of the fire industry, but they are also few and far between.

TELOMER BASED

Now lets look at the foam concentrate products themselves. There are several choices to be made here. Firstly we need to move away from PFOS or PFOA containing products and there are a wide number of cost-effective PFOS free and PFOA free protein based and synthetic based products to choose from. Telomer based PFOS-free fluorine containing foams typically use about ½ to ⅓ the quantity of fluorochemicals in 3M's branded products and are focussed on high performance, so are ideal candidates to replace any existing PFOS/PFOA containing foams.

FLUORINE-FREE

We are facing a rather bewildering rush of new foams and "foam-like" media entering the market, claiming much yet providing little evidence to substantiate their claims. Many of these fluorine-free products are simply re-packaged 40 year old wetting agent products designed primarily for forestry and Class A applications. They are not suited to Class B fire fighting. These agents are usually strong detergent chemicals and can be very toxic to the aquatic environment with 96 hour LC50 values of around 1ppm (part per million). They also kill water flea, the food of fish, putting them under even more pressure. Some are also only just considered readily biodegradeable with 60-65% over a 28 day biodegradeability test.

MODERN PRODUCTS SCORE

But there are some modern F3 products which do have some niche applications for Class B fuel applications, although generally they are not as robust or wide ranging in their fire performance capabilities as the telomer based products. Leading brands in this area are Syndura and RF6, and the F3 fluorine-free training foams like TF3, TF6 and TFAL3 which cleverly mimic the induction performance and foam properties of their frontline counterparts like Petroseal FFFP for aviation, FP70 Plus in the Oil sector and Alcoseal/Niagara the multipurpose Alcohol Resistant (AR) type foams, suitable for use on hydrocarbon and polar solvent fuels. Synthetic based products are similarly supported with Trainol to mimic regular AFFFs (Aqueous Film Forming Foam) and TFA 3 mimicing average viscosity AR-AFFFs .

Care is needed as there are some foams in this broad category which claim to be "fluorine-free" yet when anaylsed have a significant fluorine

ate – PART 2

content so are effectively weak AFFFs! Others claim to be fluorosurfactant free, yet contain a fluorinated polymer within them. Clearly caution is required by the many users reviewing suitable replacements. They need to be cautious to ensure they are getting the product they really need and that does fulfil all their practical requirements.

HYDROCARBON TANK PROTECTION

Often 1x3 AR foams are being predominantly used for protecting bulk storage of hydrocarbon fuels. Without doubt the most efficient and cost-effective answer for this application lies in modern high performance FluoroProteins like FP70 Plus from Angus Fire. This foam achieves an amazing 272 points out of a maximum possible 300 in the LASTFIRE test for bulk tank applications, higher than virtually all the more expensive AR-AFFF foams.

1X3 AR-AFFF A FALSE ECONOMY?

Multi-purpose AR-AFFF type detergent based products are relatively thick concentrates with high polymer levels, making induction in winter difficult to achieve. This is especially the case for 1x3 products which are used at just 1% on hydrocarbons and 3% on polar solvents.

At 1% induction accuracy it is vitally important to be accurate not only at ambient summer temperatures above 20°C, but also at the minimum use winter temperature for the foam. Most of these AR-type polymer containing foam products are not suitable for use below +1.7°C. Even at these cool temperatures induction at 3% is a

Large capacity aspirated foam Monitors like Colossus are ideally suited for efficient use of foams like FP70 Plus onto large tank fires

MEX Bund Pourers provide exceptionally stable yet fluid foam blanket for bund protection with natural protein based foams like FP70 Plus, Alcoseal and Niagara

challenge for most portable inductors or fixed proportioning systems. When the claimed induction rate is reduced further to 1% it becomes very difficult to maintain induction of these shear-thinning polymeric foams to effective levels within the 1-1.25% tolerance band required by international standards like NFPA 11, BS EN 1568 and UL 162. It is difficult enough in summer, but just not practical in winter!

Do you really want to rely on a concentrate that will not induce properly in winter conditions? When fire strikes on a winter's day inducing these foams may only achieve 0.5% or less. There is therefore a risk that insufficient foam is mixed with the water to provide the fast control needed. It could even fail to achieve the objective, resulting in potential danger to life and/or significant financial losses as a consequence. Alternatively it may extinguish over such a prolonged period that the foam supply runs out before a stable foam blanket can be built up to ensure re-ignition does not occur. Water alone could then be delivered onto the fire, which could cause dangerous flare-ups and potentially major re-involvements. Inevitably if used in anger on a large fire these foams will often be used at 3% to gain the control needed, but of course the user is likely to have calculated his foam stocks on the basis of using it at just 1% for such an event. It is therefore quite likely that insufficient foam will be stored on site to achieve rapid extinction even though these products are significantly more expensive and potentially more harmful with higher fluorine contents than alternative 3x3 AR products. Anyone using such products would do well to consider holding larger stocks than full use at 1% would suggest, in case they need to use higher induction rates in an incident! If you are tempted down this route then check out the products available and compare their certificated LASTFIRE test performances. However there are probably better answers to consider as more effective solutions to your problems.

FP 70 Plus lasts longer and seals better against the red hot metal tank shell, and is among the most efficient uses of C_6 telomer based fluorocarbon surfactants there is, in modern fire fighting.

MODERN FPS ARE BEST

Modern FP foams like FP70 Plus are the only ones without viscous polymers that have passed the tough Lastfire test in all 3 application categories:

- forceful semi-aspirated "big gun" monitor nozzles with the highest test application rate of 4 litres/min/m^2
- forceful well aspirated "foam cannon" monitor nozzles at the lower application rate of 3.2 litres/min/m^2
- the more gentle system pourer nozzle which simulates a fixed foam top pouring system fitted to the tank with the lowest application rate of all at just 2.5 litres/min/m^2.

Realistic design application rates for real fire scenarios are normally about double these test rates, with fixed pourer systems normally calculated at 4.1 litres/min/m^2, forceful monitors on small tanks up to 18m dia at 6.5 litres/min/m^2 or where crude oil is involved 8.2 litres/min/m^2 and larger tanks of 45m to 110m dia at around 10-12.5 litres/min/m^2.

The leading FP brands like FP70 Plus are able to provide a stable, heat resistant low expansion foam blanket which tolerates forceful punging with the hydrocarbon fuel and yet exhibits minimal fuel pick-up into the foam blanket, unlike the detergent based AFFF and AR-AFFF types which are prone to emulsification with the fuel, resulting in reduced post-fire security of the protecting foam blanket. FP 70 Plus lasts longer and seals better against the red hot metal tank shell, and is among the most efficient uses of C6 telomer based fluorocarbon surfactants there is, in modern fire fighting.

HIDDEN PROBLEMS

The polymer in AR-AFFFs is designed to make standard AFFFs (invented for shallow aviation spill fires – not deep seated tank fires) behave more like the leading FP foams, but at significant extra cost. Other problems can be posed by these AR-AFFF products as some may suffer from potential logistical difficulties with induction accuracy – especially when used at 1% as discussed earlier. Much higher fluorine levels and premature ageing, where the polymer can sometimes drop out of

solution and leave a jellifed mass at the bottom of the drum or bulk tank, which is then liable to block induction devices. Should this separation occur, the foam is wrecked and needs immediate replacement. This can occur in high temperature storage or freeze–thaw cycling during a cold snap in winter conditions. These are possible problems that just do not occur with FP foams as there is no polymer present, and FPs have been shown to be very stable in a wide range of long term storage conditions, even under some of the harshest conditions on the planet.

If there are smaller hazards of polar solvent fuels on site, it would be worth considering a separate and preferably fixed automatic foam proportioning and delivery system for these specific areas, which uses a smaller quantity of the more expensive AR-FFFP or AR-AFFF type concentrate for these more complex fuels.

ALL-ROUND VERSATILITY SOLVES PROBLEMS OF MIXED RISKS

The second answer is most appropriate for varied applications where the balance of hydrocarbon and polar solvent hazards are equal or tipped towards more polar solvent inventory, and so called “mixed risks” where both fuel types are stored. In some instances like Municipal Fire & Rescue Services or Civil Defence organisations, fire-fighters frequently do not know exactly what grades of fuel are involved. In such cases they must assume that polar solvents may be present and so need a multi-purpose AR type product. In both these situations the most likely risk is a shallow spill fire in a road traffic accident, manufacturing process area, tanker loading bay or marine terminal area. Maximum product versatility from a multi-purpose AR type is therefore required to provide rapid control and extinction of any incident.

Easy year-round induction

The natural inclination of a foam user would therefore be to choose the ideal product for his mixture of hazards. A product that works well on both hydrocarbon and polar solvents would be a pre-requisite. A single 3% induction rate would be a distinct advantage as

The latest high performance Niagara foam from Angus Fire in action. Its polymer free multipurpose application gives fast knockdown on hydrocarbon and polar solvent fuels

FP70 Plus ideal for MTBE and unleaded gasoline hazards, now also with excellent Lastfire results

the correct proportioning rate is then always assured whether the hazard involves hydrocarbons and/or polar solvents, and there is enough safety margin that if the proportioners being used are not particularly accurate the product will still work effectively. This foam concentrate also needs to flows easily, preferably without those viscous polymers that could give proportioning or storage difficulties, even in a matter of months. It also needs to be useable year round and not freeze solid as soon as the ambient temperature drops much below freezing, an independent international approval for use down to –18°C would certainly amply fill that box with a tick!

Multiple applications

Such a product would also needs to resist hydrocarbon fuel pick-up well when applied forcefully and provide rapid control and extinction on both hydrocarbon and polar solvent fires, yet also offer good post-fire security from a preferably natural protein base material, which makes for a more robust bubble structure retaining water where it is needed on the surface of each bubble. It would need to be useable at Medium Expansion (MEX) for fast coverage of bunded areas surrounding storage tanks with a deep blanket which helps to minimise splashing and covers pipes, valves and flanges with a cooling foam blanket to prevent them getting hot from the flames, distorting and rapidly leaking more product which risks escalating the incident.

MEX foam is also valuable as a vapour suppressing agent for liquid spillages which have not yet ignited or for those which give off toxic vapours when released like Chlorine and Ammonium hydroxide. In some instances doubling the recommended induction rate can give a very stable and long lasting foam blanket for such situations. Additional versatility would also be useful, like the flexibility to be used through conventional "non-aspirated" (NAF) water nozzles for hydrocarbon fires aswell as the more conventional low expansion (LEX).

Extra Class A capability

Of particular benefit to Municipal Fire Departments would be for such a product to be useable as a wetting agent on Class A fires from as low as 0.2% and Compressed Air Foam Systems (CAFS) from 0.6% both up to 1%. The ability to also use it at just 1% on shallow hydrocarbon spill fires would also help the user to have a more cost-effective answer on smaller fires and allow effective training of the crews who are going to use it in anger on real fires. Does such a product exist that offers all this versatility with inherent reliability as well?

The most significant technological innovation in fire fighting foam circles for many years form the leaders in fire fighting foam technology achieves all these requirements. It is called Niagara, the totally polymer-free natural protein based AR-FFFP concentrate suitable for use down to –18°C and meets all the above requirements. Its unique chemical formulation offers all mixed risk foam users the optimum flexibility and all-round capability you need. It also comes with full independent Underwriters Laboratories UL 162 approval for multipurpose use on a wide range of flammable liquids through portable equipment, fixed foam systems, non-aspirated nozzles and sprinkler systems. It can even be used through CAFS systems unlike all polymer containing AR type foams.

Care for the Environment

Careful selection of ingredients has enabled products like Niagara to have low environmental impact when released into the environment with low aquatic toxicity levels (96 hour LC50 values on Rainbow trout of just 2,830ppm -several times less toxic than many AR-AFFF types) and 95% biodegradeability over the 28 day test period. The natural base material also ably assists this exceptional environmental performance, which shows significant improvements over more conventional synthetic detergent based wetting agents and AR-AFFFs, where the detergent base alone is quite highly toxic to aquatic organisms.

Climatic conditions are not a problem either, since it is the world's first multi-purpose AR type foam with independent UL 162 approval for use from +49°C down to –18°C, ensuring it is ready for action so you achieve highly effective and versatile fire fighting all year round.

WHY NOT DO YOUR OWN REVIEW?

Whether you have already completed a foam policy review or are just starting one, I am sure you would agree that a supplier audit is a key element to achieving a stable supply route going forward with a product that provides you with the most cost-effective answer to meet your needs. Only then can you achieve a partnership capable of delivering best value, for the money invested. So isn't it time you checked out your current foam supplier and the product(s) used, to see whether they are delivering what you really need?

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RFC43

F1RES44 HSW

Flat Concealed Residential Sprinkler

Room Size (m)	Viking Freedom Residential VK425		Tyco LFII Conc.		Reliable RFC43	
	Flow	Pressure	Flow	Pressure	Flow	Pressure
3,7 x 3,7	56,8 Lpm	0,93 bar	49 Lpm	0,66 bar	**45 Lpm**	**0,54 bar**
4,3 x 4,3	60,6 Lpm	1,05 bar	53 Lpm	0,77 bar	**49 Lpm**	**0,63 bar**
4,9 x 4,9	75,7 Lpm	1,65 bar	61 Lpm	1,00 bar	**49 Lpm**	**0,63 bar**
5,5 x 5,5	-	-	76 Lpm	1,57 bar	**68 Lpm**	**1,21 bar**
6,1 x 6,1	-	-	91 Lpm	2,25 bar	**79 Lpm**	**1,64 bar**

Horizontal Residential Sprinkler

Room Size (m)	Viking VK450		Tyco LFII HSW		Reliable F1RES44 HSW	
	Flow	Pressure	Flow	Pressure	Flow	Pressure
4,3 x 4,3	53 Lpm	0,77 bar	53 Lpm	0,77 bar	**53 Lpm**	**0,71 bar**
4,9 x 4,9	68 Lpm	1,27 bar	61 Lpm	1,00 bar	**61 Lpm**	**0,92 bar**
4,9 x 5,5	68 Lpm	1,27 bar	72 Lpm	1,41 bar	**68 Lpm**	**1,16 bar**
5,5 x 5,5	-	-	-	-	**72 Lpm**	**1,29 bar**
4,9 x 6,1	83 Lpm	1,90 bar	87 Lpm	2,07 bar	**87 Lpm**	**1,89 bar**

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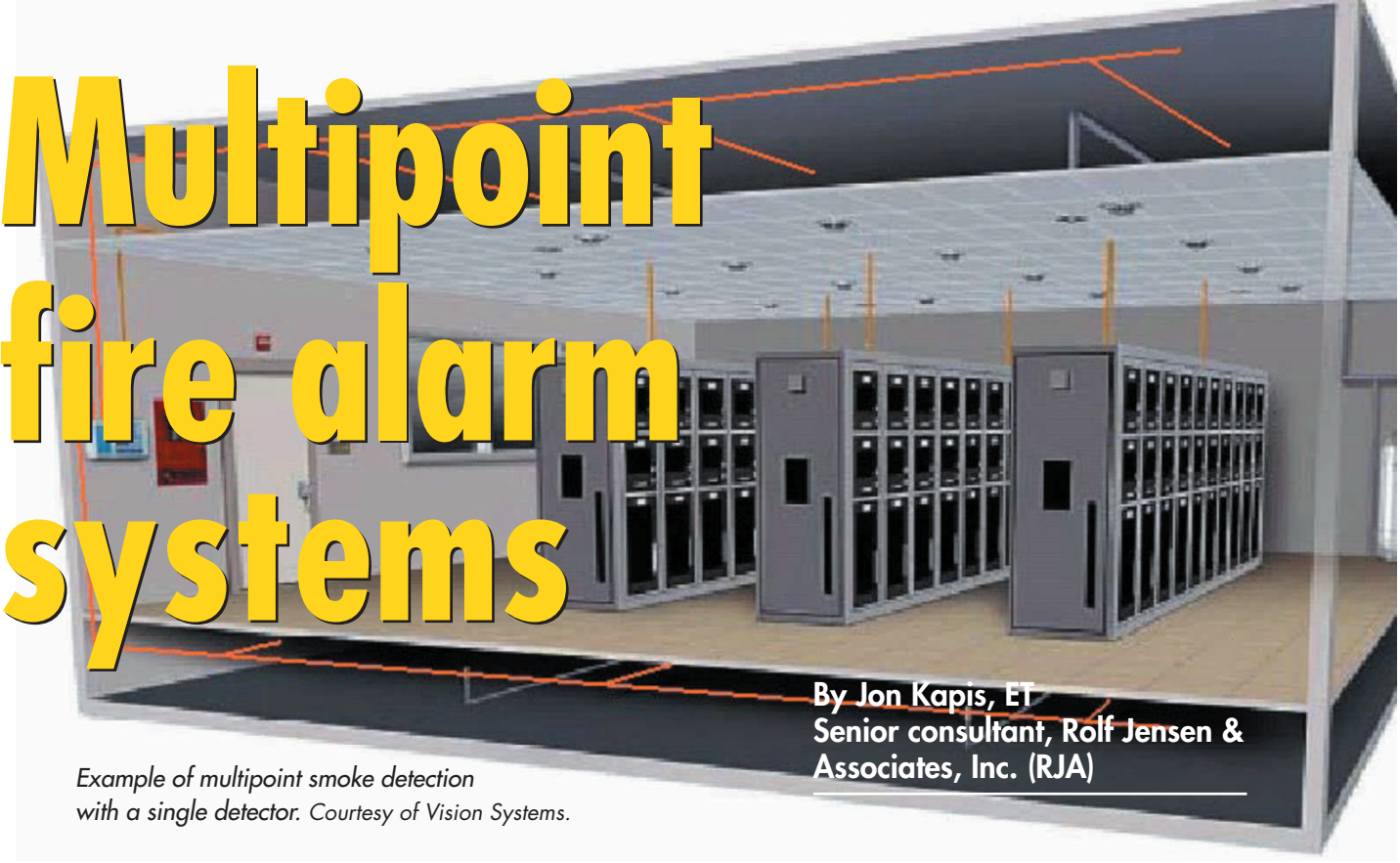
Multipoint fire alarm systems



Example of multipoint smoke detection with a single detector. Courtesy of Vision Systems.

By Jon Kapis, ET
Senior consultant, Rolf Jensen & Associates, Inc. (RJA)

What is Multipoint Fire Alarm Systems?

OVER THE LAST QUARTER OF A CENTURY, this term has been used widely to describe various aspects of the ever-changing fire alarm system industry. During this evolutionary process, the control equipment previously located within a central fire command room, changed to a distributed processing network control equipment system, located throughout a building. We have seen increasing ability to transmit specific detailed information to an off-site alarm monitoring station; the transformation of conventional initiating devices to intelligent analog sensors, and the emergence of intelligent notification appliances; all of which utilize the term "multipoint" in one form or another.

The common factor of the evolutionary process has been ability to do more with fewer conductors. It is no longer necessary to install hundreds of conductors within a vertical riser, or an equally large quantity of conductors between systems, for point annunciation. While you can do more with fewer conductors, the size of the conductors has also remained small due to switching from current carrying circuits to data transmission circuits. We will examine in detail some of the aforementioned changes that have constituted multipoint fire alarm systems.

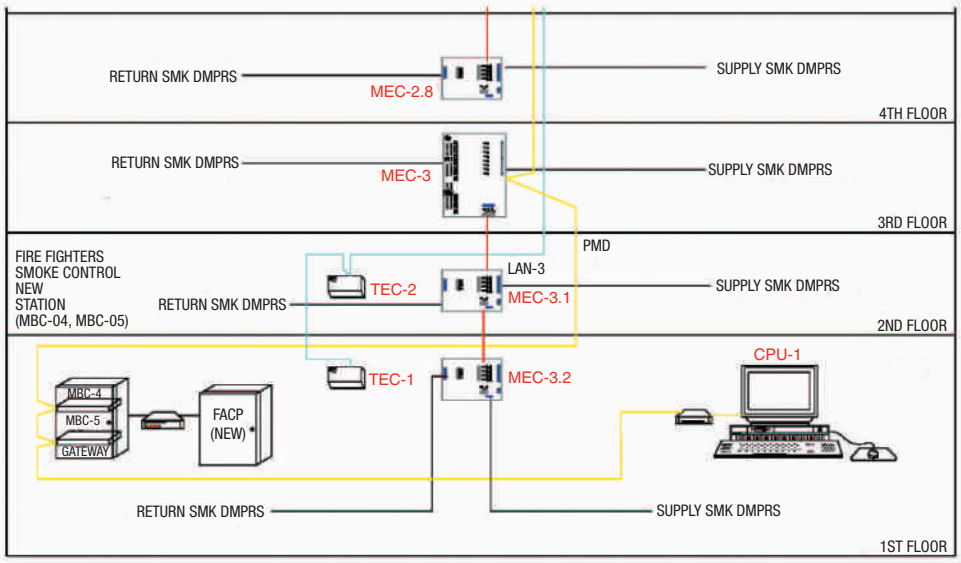
FIRE ALARM CONTROL PANELS

Long passed are the days when fire alarm system enclosures filled an entire fire command room of a high-rise structure or large building complex. Previously, hardwired systems operated from a central processor controlling all of the necessary amplifiers, power supplies, relays, initiating device circuits, notification appliance circuits, and other auxiliary functions. That type of system configuration has since given way to distributed system components and multiple system processors.

The late 1970's introduced the beginning of this evolutionary process. Fire alarm system manufacturers began providing a means to remotely locate the necessary circuits, power supplies, and amplifiers closer to the floors or areas being protected. This reduced the need for lengthy circuits and bulky conductors from the main fire alarm control panel, traversing throughout the building. These remote panels communicated to the host controller through the use of a multiplex data circuits. Initially, communication and control was very limited, and the remote panels had no way of displaying system information, and had very little local control or degrade capability. The remote panels, referred to as Data Gathering Panels or Transponders, were dependant upon the host controller for output command functions. They merely identified to the host the circuit in alarm or trouble condition while waiting for output commands.

The multipoint technology continued to develop through the 1980's and 1990's, adding addressable device and remote annunciation capabilities to the remote panels. True distributed processing system networks were introduced in the 1990's. Up until then, the majority of system event processing was done at the main fire alarm control panel. The distributed multipoint fire alarm system consisted of several intelligent fire alarm controls panels sharing information across a peer-to-peer network. Each control panel took responsibility for the command functions associated with its own internal circuits while passing on to the other control panels shared information. Typically, one control panel was designated as the primary system operating control panel or user interface

This new technology has allowed the end-user, who may be away from the fire command center, the capability of utilizing an operator's control panel on the nearest distributed network node to review the status of the entire system



Example of multipoint communication configuration between fire alarm and building automation systems.

and, possibly, control the entire system from any remote location during a system activation event. The advent of the distributed processing network allowed for fire alarm systems to process alarm events and control system functions more rapidly than a single processor system, due in part to the multiple processors. The installation of a distributed system network also meant that a critical component failure of a fire alarm control panel might not affect the entire system.

Using Style 6 or 7 communication circuits further enhances the survivability of these distributed networks. was furtherDistributed multipoint networks also make it readily feasible to expand system capacity by merely adding additional control panels to the fire alarm system network. This technology has also allowed for individual control panels in a campus environment to operate independently, yet provide detailed information to a central command center.

Multipoint technology has enabled fire alarm systems to communicate detailed information to other building systems. One such example is the integration of fire alarm systems and building automation systems. The ability of these two systems to work together to perform fire detection, life safety and smoke control functions can be instrumental to fire protection and maintenance of a building.

Previously, the fire alarm system needed to override fan and damper controls during a fire alarm event when smoke control systems are employed. This override control was often accomplished by installing relays ahead of the controls for the equipment designated for smoke control use. This practice led to increased coordination requirements and conflicts between trades when systems failed to operate properly, both during an emergency event and under normal operating conditions. Often these issues caused delays in system commissioning or failure of the mechanical system operation.

Through multipoint technology, a simplified process of extracting data from the fire alarm system across a digital gateway/processor can allow a building automation system to maintain sole control over the mechanical system fans and dampers in both emergency

and non-emergency conditions. The building automation system is provided a data signal by the fire alarm system in the event of an alarm condition. The transmitted signal identifies the device type and location of the alarm event, which allows the building automations system to initiate the proper smoke control sequence. Some of the more common protocols of this multipoint standard are known as BACnet®, LonTalk®, Modbus® and OPC. Although many engineers believe that smoke control functions should be managed by the fire alarm system, many end-users and facility engineers would agree that it is easier to maintain and support mechanical system components that are entirely under the control of the building management system.

SMOKE DETECTION

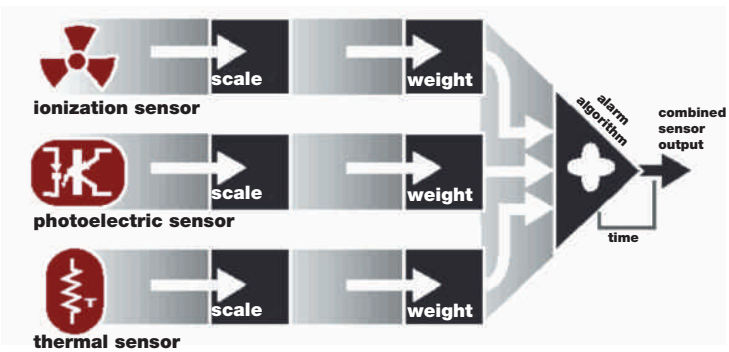
Changes in system technology and the need to increase fire detector sensitivity, while reducing nuisance alarms, has led to the development of analog smoke sensors. Analog fire and smoke sensors tend to use a combination of photoelectric and heat detection, or a combination of photoelectric, ionization and heat detection, coupled with algorithmic functions to sense the environment for multiple characteristics of a fire. The combination of the detection methods and algorithms allow a smoke sensor to be adjusted to specific environmental conditions that can provide appropriate sensitivity settings of the device based upon environmental conditions or need.

These smoke sensors gather analog information from their various sensing elements and convert it into digital signals. An on-board processor measures and analyzes the multipoint signal information separately against a time factor and compares the information to historical readings, time patterns, and known fire characteristics to make an alarm decision. Digital filters remove data patterns that are not typical of a fire condition, thus reducing the possibility of unwarranted alarm events.

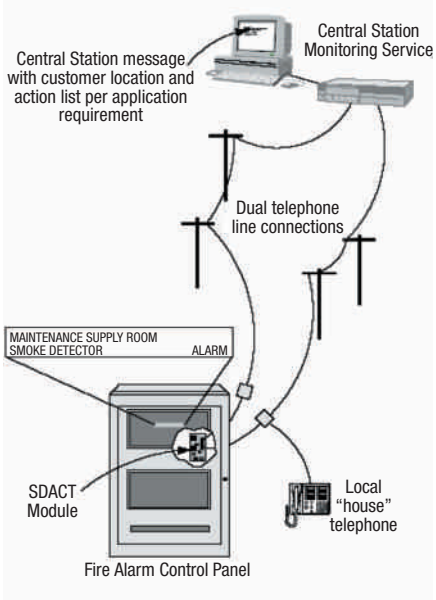
This multipoint intelligent technology was initially developed and released for use with addressable technology devices. However, the success of the multipoint sensor technology has found its way to conventional hardwired smoke detection devices, allowing simpler fire alarm systems to benefit from the improvement to differentiate a nuisance alarm event to an actual fire alarm condition.

The information from these smoke sensors is transmitted back to the fire alarm control panel on a single pair of wires, where it can be viewed by the system operator.

Another form of multipoint smoke detection can be found in air aspirated smoke detection systems. This is the ability to sample air from various points in a room or space and evaluate them in a single central detector. Multipoint air aspirated smoke detection is often used within computer or clean rooms, where smoke detection in the incipient stages of a fire is needed. The multiple points of smoke detection may be areas such as the sub floor space, the general room space, and the above



Example of multipoint smoke sensor technology.
Courtesy of Edwards Systems Technologies, Inc.



Example of serial dact communications. *Courtesy of SimplexGrinnell*

ceiling space of an occupied area. Each of these zones can be sampled by a single detector and analyzed through a laser light for products of combustion consistent with an insipient fire. The air aspirated detector can identify the zone of origin within the area protected and be configured to respond within an alarm condition when either a single zone is activated, or when more than one zone detects smoke.

CENTRAL STATION SERVICE

As the fire alarm systems continued to develop, so did the capabilities of the central receiving stations. For many years the only information transmitted to emergency responders was that of a general building fire alarm associated with a street address. Afterwards, multipoint alarm transmitters and receivers began to be developed. This next generation of fire alarm system reporting allowed for a central station service to differentiate between an alarm signal and a trouble signal that would alert the building owner of a system concern. The need for more information has continued to push this technology forward; nearly replicating the technology used fire alarm control panels. Through the use of Serial Digital Alarm Communicating Transmitters (SDACT) and Digital Alarm Communicating Receivers (DACR), it is now possible to transmit multipoint information across a pair of telephone lines.

Central station service providers can obtain the same detailed point information as the end user. This newer technology allows for the receiving station to pass along to the responding personnel more exact information about the alarm signal, device type, building number, floor of alarm, and the location. This information can then be used to help determine the appropriate response. If more initiating devices are activated while the responders are in route, to the incident, the monitoring company can relay that information. This will provide responders with the necessary information to increase the emergency response, or elevate the alarm condition.

Although this technology has existed during the last several, it is not widely accepted due, in part, to the fee structure typical of monitoring companies. They usually charge a fee per status point monitored. Codes typically require that a general alarm, trouble, and supervisory signal be transmitted to an alarm receiving station.

ADDRESSABLE NOTIFICATION APPLIANCES

Another change in multipoint technology deals with notification appliances. The 1970's brought addressable initiating devices and control relays that could function and annunciate independently over a single pair of wires. Similarly, we now see an increasing number of manufacturers developing this technology for notification appliances. Addressable technology has made it possible to control the activation of visual notification appliances and non-voice audible notification appliances, either independently or within zones.

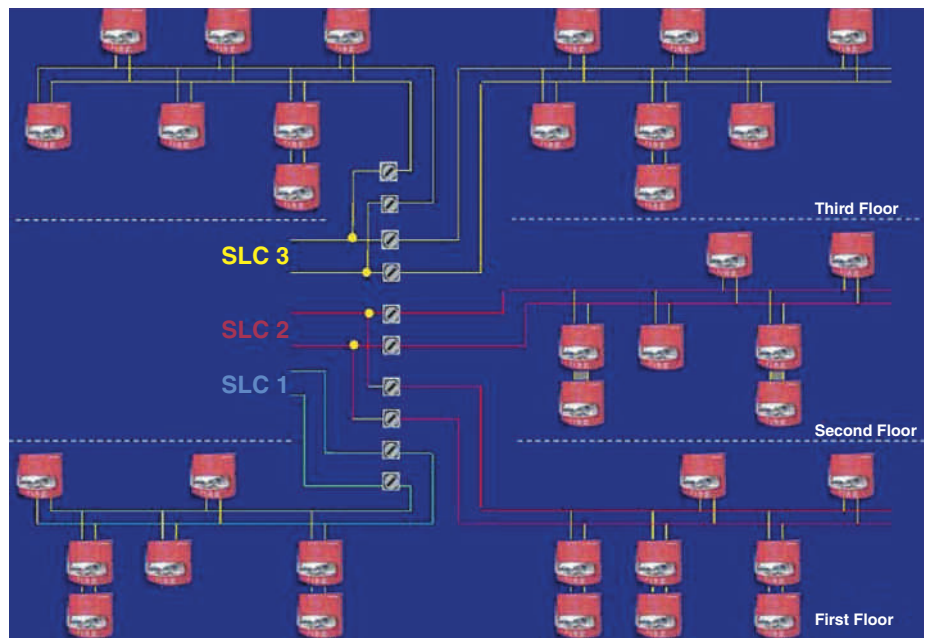
This technology has been successfully implemented in the hospitality industry where a single visual notification appliance can be installed within a designated guest room for the hearing impaired, coupled with fire alarm system monitored local smoke detector. Upon activation of the smoke detector within the guest room, the visual notification appliance can alert the occupant within the space of origin. This same device can be controlled through system programming to operate with the other visual appliances within the same zone for a general alarm condition. The overall benefit is fewer devices and less wiring and conduit than other options to achieve the same result. Estimates of cost savings are between 10%-30%.

Additionally, because this technology utilizes communication protocols similar to the addressable technology of the last 25 to 30 years for initiating devices and control relays, notification appliance circuits can also employ t-tapping of wiring consistent with Style 4 signaling line circuits installation requirements.

This new technology can also improve the ability to synchronize notification appliance circuits covering large open areas where multiple circuits are often found, as well allow for the creation of virtual zones of notification appliances from a single circuit.

With the continuing development in multipoint fire alarm system technology, it appears as if fire alarm systems and system integration will continue to improve. The continuing trend of fewer system conductors and more data signaling capability will provide for more intelligent systems and a greater source of critical information for the end-user and responding personnel alike.

Located in the San Francisco office, Jon Kapis, ET is a senior consultant Rolf Jensen & Associates, Inc. (RJA). To learn more about RJA, visit their website at www.rjainc.com



Example of addressable notifcation appliance circuits. *Courtesy of SimplexGrinnell*

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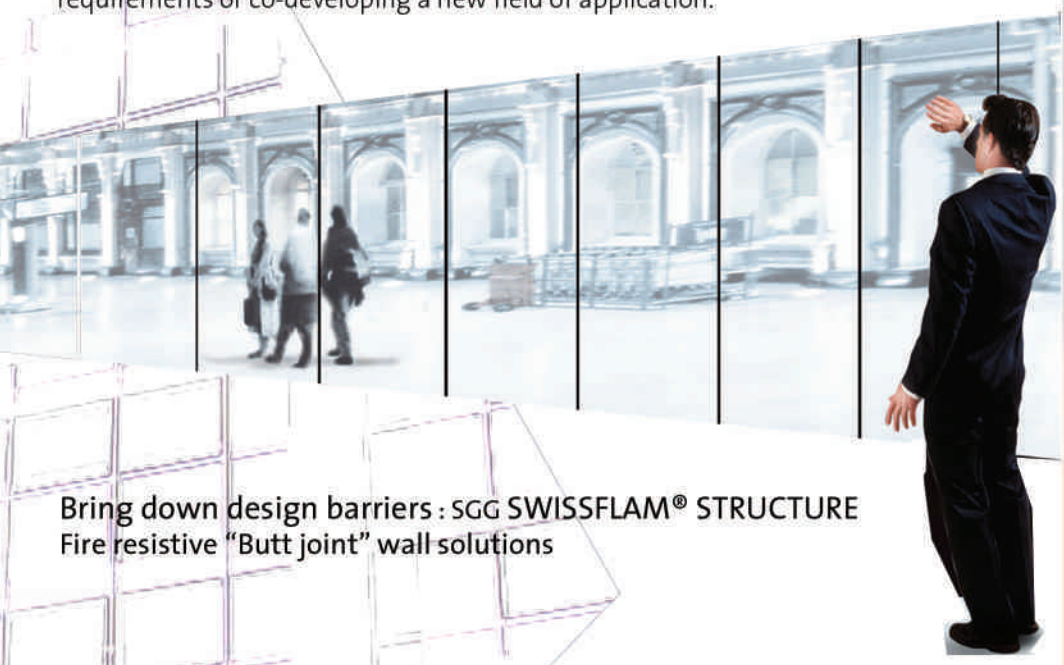

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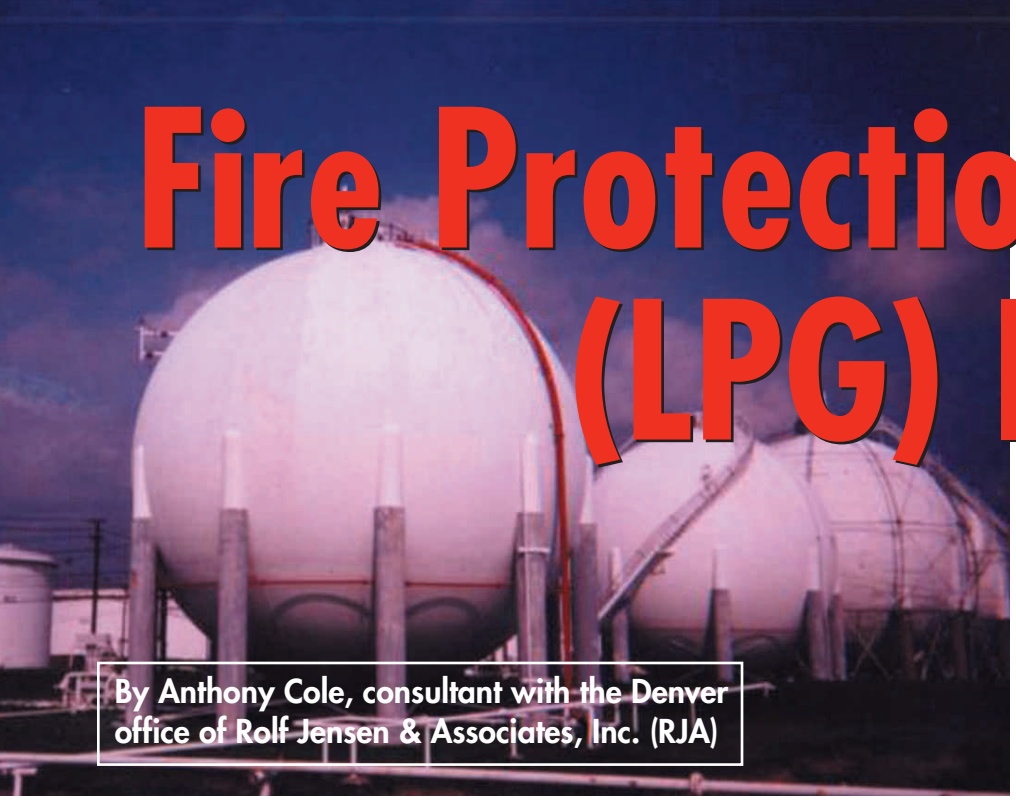

By Anthony Cole, consultant with the Denver office of Rolf Jensen & Associates, Inc. (RJA)

Pic courtesy of RJA

IN DEVELOPING FIRE PROTECTION METHODS and guidelines for liquefied petroleum gas (LPG) storage facilities, the chief concern is a massive failure of a vessel containing a full inventory of LPG. The probability of this type of failure occurring can be mitigated or at least controlled to a reasonable and tolerable figure with appropriately designed and operated facility. Since most LPG fires originate as smaller fires that become increasingly more dangerous, this article will focus on fire protection methods and guidelines in relation to small leaks and fires in LPG spheres. Of greater importance to the fire protection engineer is the more likely event of a leak from a pipe, valve, or other attached component leading to ignition, flash fire, pool fire, and eventually to a pressure fire at the source.

DEFINITION AND PROPERTIES

LPG was first discovered in the 1900s. The applications and uses of LPG, which range from cooking and refrigeration to transportation, heating, and power generation, make it an all-purpose, portable, and efficient energy source. LPG consists of light hydrocarbons (propane, butane, propylene, or a mixture) with a vapor pressure of more than 40 psi at 100°F. At standard temperature and pressure, LPG is in a gaseous state. LPG is liquefied by moderate changes in pressure (i.e. in a process vessel) or a drop in temperature below its atmospheric boiling point. The unique properties of LPG allow for it to be stored or transported in a liquid form and used in a vapor form. LPG vapors are heavier than air and tend to collect on the ground and in low spots. After LPG is released, it readily mixes with air and could form a flammable mixture. As a release occurs, there will be an area closest to the release that is above the flammable range, an intermediate area that may be in the flammable range, and areas that will be below the flammable range. Mixing, natural currents, and diffusion of LPG vapors affect the size and extent of these areas. If these processes continue, eventually the mixture is diluted to below the lower flammable limits (LFL).

Other characteristics of LPG include:

- LPG exerts a cooling effect as a result of vaporization due to releases at low pressure (as called autorefrigeration).
- The density of LPG is almost half that of water, therefore water will settle to the bottom in LPG.
- Very small quantities of liquid will yield large quantities of vapor.
- When vaporized, LPG leaves no residue.
- When LPG evaporates, the autorefrigeration effect condenses the surrounding air, causing ice to form. This is usually a good indication of a leak.
- LPG is odorless, therefore, agents such as ethyl mercaptan are added to commercial grades in most countries for better detection.

Properties of Two Common LPGs

PROPERTY	PROPANE	n-BUTANE
Specific Gravity	1.5	2.p
Vapor Pressure (at 60°F)	105 psia	26 psia
Boiling Point	–44°F	+31°F
Cubic feet of gas/gallon of LPG at 60°F	36.4 ft^3	31.8 ft^3
Lower flammable limit (LFL) % in air	2.0	1.5
Upper flammable limit (UFL) % in air	9.5	9.0
Gross Btu/ft^3 of gas at 60°F	2,516 Btu/ft^3	3,262 Btu/ft^3

Table 1 from 1996 edition of API 2510A

Tank Pressures for Two Common LPGs

LIQUID	QUANTITY	VAPOR VOLUME (gal.)	VAPOR VOLUME (ft^3)	VOLUME of GAS/AIR MIXTURE at LFL (ft^3)
Propane	1 gal.	270	36	1,680
n-Butane	1 gal.	230	32	1,630

Table 2 from 1996 edition of API 2510A

Vapor Volumes Obtained for Two Common LPGs

LIQUID TEMPERATURE	PROPANE	n-BUTANE
31°F	50 psig	0 psig
60°F	90 psig	11 psig
100°F	175 psig	37 psig
130°F	250 psig	65 psig
140°F	290 psig	80 psig

Table 3 from 1996 edition of API 2510A

uefied Petroleum Gas ons: The Basics

Pic courtesy of RJA

PRODUCTION AND OPERATIONS

LPG is derived from two main energy sources: natural gas processing and crude oil refining.

When natural gas wells are drilled into the earth, the gas released is a mixture of several components. For example, a typical natural gas mixture may be (90%) methane or "natural gas", while the remaining percentage of components (10%) is a mixture of propane (5%) and other gases such as butane and ethane (5%). From there the gas is shipped in tankers or via pipeline to secondary production facilities for further treatment and stabilization. From these facilities it is sent by bulk carrier or pipeline to various industrial plants and gas filling facilities or used for power generation.

LPG is also collected in the crude oil drilling and refining process. LPG that is trapped inside the crude oil is called associated gas. The associated gas is further divided at primary separation sites or Gas Oil Separation Plants (GOSP's), Central Processing Facilities (CPF's) for offshore installations or Drilling, Production, and Quarter's Platforms (DPQ's). At these facilities, the produced fluids and gases from the wells are separated into individual streams and sent on for further treatment.

At refineries, LPG is collected in the first phase of refinement or crude distillation. The crude oil is then run through a distillation column where a furnace heats it at high temperatures. During this process, vapors will rise to the top and heavier crude oil components will fall to the bottom. As the vapors rise through the tower, cooling and liquefying occurs on "bubble trays," aided by the introduction of naptha. Naptha is straight run gasoline and generally unsuitable for blending with premium gasolines. Therefore, it is used as a feedstock in various refining processes. These liberated gases are recovered to manufacture LPG.

In commercial applications, LPG is usually stored in large horizontal vessels called "bullets." These bullets can range in volume size from 150 to 50,000 gallons. In industrial applications, LPG is typically stored in large vessels that are sphere or spheroid shaped. These are the large "golf ball" shaped and oval vessels commonly seen at refineries and other similar occupancies. In this article, we will deal primarily with the protection of LPG spheres.

STANDARDS

Various sources of standards and codes exist for dealing with LPG facilities and proper fire protection. Some of these sources include:

- NFPA 54, *National Fuel Gas Code*.
- NFPA 58, *Liquefied Petroleum Gas Code*.
- NFPA 59, *Utility LP-Gas Plant Code*.
- American Petroleum Institute (API) 2510, *Design and Construction of LPG Installations*.
- American Petroleum Institute (API) 2510A, *Fire-Protection Considerations for the Design and Operation of Liquefied Petroleum Gas (LPG) Storage Facilities*.
- IP Code of Practice for LPG

Additional sources of information can be obtained from various organizations such as the British Standards Institute, the World LP Gas Association, The LP Gas Association, and industry producers and suppliers. For the purpose of this article, we will focus on some of the above-mentioned sources that are typically accepted as the industry standard.

FIRE PROTECTION DESIGN CONSIDERATIONS

In order to reduce the fire risk at LPG facilities, adherence to various design considerations and requirements such as layout, spacing, distance requirements for vessels, drainage, and containment control will help to limit the extent of fire damage. Additional considerations such as fireproofing, water draw systems, and relief systems are also important with respect to the integrity of the installation and the reduction of risk. These considerations address the various ways to prevent leaks or releases that may lead to a fire.

Equally as important to the prevention of a leak or release is properly designed, installed, and maintained fire protection systems. These systems attempt to minimize or limit the fire damage once a fire occurs. In the situation that a fire does occur, the levels of required fire protection are affected by several factors such as location and remoteness of the fire and the availability of water.

To determine if cooling water is required, the anticipated radiant heat flux from an adjacent tank, maximum tank shell temperatures if the vessel shell is not cooled, and other specific risk management guidelines must be analyzed. API 2510A contains a procedure to identify the point at which cooling water should be applied based on the size of the pool fire and the distance between the vessel and the center of the fire (Figure 1.) Additionally, an analysis of the relief valve parameters is necessary to maintain certain internal vessel pressures. Although computer models

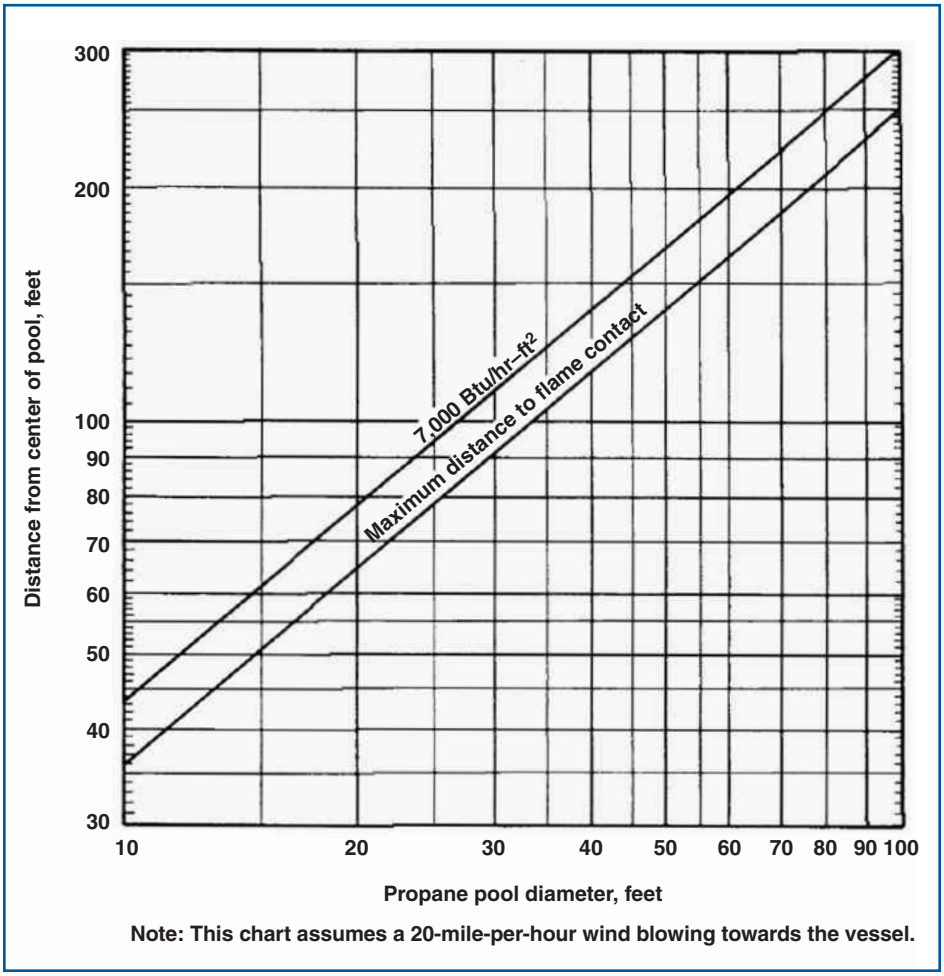

Figure 1. Pool Fire Radiant Heat Flux, from 1996 edition of API 2510A.

are available to more accurately anticipate the heat fluxes, this procedure helps to determine if a more detailed study is required.

Figure 1 considers the radiant heat flux from a pool fire, assuming a 20-mile-per-hour wind. To illustrate this procedure, first locate the diameter of the pool fire along the x-axis. Using an imaginary line from the designated point along the x-axis, locate the corresponding point of intersection on the 7,000 BTU/hr-ft^2 line. Next, extend an imaginary horizontal line to the y-axis. The corresponding point of intersection on the y-axis is the distance between the vessel and the pool fire at which cooling water must be applied. For example, if a pool fire is 30 feet in diameter, it is necessary to apply cooling water when the distance between the vessel and the center of the pool fire is approximately 120 feet.

In general, there are three primary methods that can be used to apply water for cooling or extinguishment to LPG vessels exposed to fire. The three methods are: water deluge, fixed monitors, and water spray. Additionally, portable equipment such as ground and trailer mounted monitors can be utilized, but should not be considered a primary means of water delivery. This is mainly due to the potentially extended set-up times, logistics, and requirement of human intervention that is not necessarily reliable.

The table below describes some of the advantages and disadvantages of the 3 primary water application methods and the use of portable equipment.

The first method involves the use of a water deluge system and some form of water distributor. This could include high-volume spray heads, perforated pipe or a distribution weir. An underflow or overflow weir is a form of distribution weir that allows water to be evenly distributed over the surface area of a sphere by water flowing up the piping network, over the top of the sphere, and out of the weir. This type of water distributor is commonly used but is prone to corrosion from standing water and clogging and requires increased preventative maintenance. Additionally, weirs may not be as effective on bullets and are often greatly affected by wind. The remaining components of this method are similar to other deluge installations. The typical deluge system contains a supply piping network, deluge valve and trim, and a branchline-piping network near the top of the sphere. Newer installations are usually activated automatically, whereas older installations are commonly activated manually. The decision as to which activation method to use requires evaluation of spacing, available protection, exposures, and other factors.

The principle behind the use of a deluge or weir system for LPG sphere protection is that the geometric shape of the sphere and gravity work together as an advantage. As water is applied to the top of the vessel, the shape of the sphere and the force of gravity facilitate the flow of the water as it covers the surface area of the vessel. This type of protection is very effective to facilitate an even distribution of water over the surface area. Caution should be exercised, however, because paint, corrosion, dust, and other environmental influences can cause changes in the surface of the sphere, resulting in uneven water distribution. Additionally, settling and other conditions inside the weir can also cause uneven water flow over the sphere's surface.

Fixed monitors, the second method of water application, permit the use of

Various Applications of Water for LPG Sphere Fires

Application Method	Advantages	Disadvantages
Water Deluge	1. Rapid activation 2. Can be automatic 3. Lack of plugging	1. Problems with wettability 2. Possible water spray supplement for legs 3. Effectiveness with jet fires
Fixed Monitors	1. Ease of activation 2. Can be automatic 3. Effective for jet fires	1. Exposure to operators 2. Wind 3. Large water demand 4. Monitors may be changed unknowingly
Water Spray	1. Rapid activation 2. Wettability and run down 3. Can be Automatic	1. VCE damage 2. Plugging 3. Effectiveness with jet fires
Portable Equipment	1. VCE damage not an issue 2. Specific application to area 3. Portability for multiple hazards	1. Prolong set-up times 2. Manual 3. Exposure to operators

Table 1 from 1996 edition of API 2510A

Pic courtesy of RJA

fixed hydrant mounted monitors or individual monitors connected to the fire main to apply water to the fire area. In this case, water application is accomplished by operators manually opening valves to allow the flow of water to the LPG sphere. This procedure exposes operators to high heat fluxes and places them dangerously close to vessels under fire conditions. It is important to carefully study the plant and vessel layout if this method is elected. Proper placement, location, and quantity of fixed monitors must be reviewed and field tested to ensure that proper application and even distribution of water to all parts of the vessel is accomplished. In some cases, remote activation and operation is suggested when proper spacing of monitors is not a possibility. Additionally, annual testing and preventative maintenance are necessary to ensure parameters have not changed and that coverage is still adequate.

The third method of application is the use of water spray systems. These are systems that are comprised of a piping network of spray nozzles that distribute water over the surface area of an LPG sphere. The spray nozzles are positioned to form a grid pattern which facilitates the complete coverage of the sphere's surface area. Larger orifices and piping should be considered to help reduce blockage due to scale and mussel build-up and other potential problems. It is also important to properly size the strainer to prevent blockage. Inspection of strainers should be part of the preventative maintenance program.

The last method available is the deployment of portable monitors and hoses. Although not one of the three primary methods of water application, preparations and planning for this type of application should not be forgotten.

When utilizing the four water application techniques discussed previously, a combination of techniques provides ample fire protection; a deluge or water spray system and portable monitors. A combination of a water deluge/distributor with a fixed water spray system with portable monitor back up from the fire department provides excellent coverage.

A water application rate for these fixed fire protection systems depends on the type of fire situation. When a vessel is exposed to only radiant heat without direct flame contact, a density of 0.1 gpm per square foot of vessel surface area is the minimum. If direct flame contact, or impingement, occurs, a density larger than 0.1 gpm, up to 0.25 gpm per square foot of vessel surface area is the minimum.

For fixed or portable monitors, 250 to 500 gpm is the minimum. However, field verification and flow testing is necessary to ensure adequate and proper coverage is provided. Placement of monitors must also be field verified against approved plans to ensure acceptable spacing and access.

Vapor, heat, or flame detectors mounted in the vicinity of a vessel can complete automatic activation of these systems. The use of vapor detection provides early detection and warning, but activation of water application systems must be confirmed through flame detection. Flame detection provides quick activation, but use caution when positioning these detectors to prevent false activation from sunlight. Consideration need also be given to the installation of UV/IR combination detectors to reduce the false indication rate. These devices require testing and preventative maintenance programs. An evaluation of the facility is necessary in order to determine the correct type and location of devices.

RESPONSE

Even with the proper installation of fixed fire protection system, the importance of emergency response to LPG fires cannot be disregarded. LPG fires can escalate quickly, and a lack of manual activities by the fire department can lead to vessel failure. As part of this response, an up-to-date and complete emergency response plan is an integral part. The plan should include:

- Hydrant layouts
- Hose lays and lengths
- Multiple response approaches (wind dependant)
- Vessel inventories
- Fixed protection information
- Scenarios for both un-ignited and ignited leaks

Other important factors include fire department capabilities and mutual aid agreements. Proper training and drills are also required to reduce the risk of injuries and promote a quicker and safer response to LPG events.

CONCLUSION

Since most LPG fires originate as smaller fires that become increasingly more dangerous, the use of the three primary methods to apply water in a quick manner can help reduce the risk of LPG vessel failure. The deployment of portable monitors and hoses, although not one of the three primary methods of water application, is an important back up to the primary methods. LPG fires can escalate quickly and a lack of manual suppression activities by the fire department can lead to vessel failure. It is necessary, however, to take control of the fuel source before attempting to suppress the fire. In any case, an emergency response plan, along with proper training and drills, is important to reduce the risk of injuries and promote a quicker and safer response.

Anthony Cole is a consultant with the Denver office of Rolf Jensen & Associates, Inc. (RJA). To learn more about RJA, visit their website at www.rjainc.com.

ANGUS FLIES EMERGENCY FOAM TO QUAKE-HIT JAPAN

Angus Fire has flown emergency stocks of fire fighting foam to Japan to help emergency crews deal with the aftermath of the recent earthquake.

The drama started on 26 September when a powerful earthquake measuring 8.3 on the Richter scale rocked the northern Japan island of Hokkaido. Subsequent aftershocks measured 5.0 or stronger on the Richter scale.

As a result of these tremors fire broke out in a bulk fuel storage tank at the Idemitsu Kosan Company oil refinery at Tomakomai in southern Hokkaido. Fire fighters on the scene were able to extinguish the fire in a few hours using fire fighting foam.

However, it soon became apparent that much larger stocks of foam would be required to prevent fuel that had become exposed to the air from catching fire by covering it with a vapour-suppressing foam blanket.

Fire officers decided to source the extra stocks from the Angus Fire foam production facility at Bentham, the largest of its kind in the world.

Angus Fire received the call for help in the middle of the night at 01.30 on 1 October. Within two and a half hours Angus Fire confirmed that 100 tonnes of foam concentrates including Tridol ATF and Alcoseal would be available for despatch that afternoon at nearby Manchester Airport.

However, finding a suitable cargo aircraft to transfer it to Japan proved more difficult since many had been pre-booked for humanitarian aid flights to Iraq. Angus Fire solved the problem by chartering a Boeing 747 "Jumbo Jet" cargo aircraft to be flown specially from New York into Manchester.

The aircraft was loaded throughout the day on 3 October and flew out to Sapporo Airport in Japan via Alaska that evening. SOS Air Cargo, Menzies World Cargo, Ringway Handling Services and Manchester Airport all helped Angus Fire with the transport logistics.

This latest incident further strengthens the track-record of success which Angus Fire has established in delivering urgently needed supplies of foam to major incident sites around the world.

Angus Fire is part of Kidde plc, the largest independent fire and safety equipment supplier in the world. Angus Fire's Managing Director Chris Milburn commented, "I'm delighted we were able to organise for our product to be flown to Japan so quickly. This has been a real team effort with many people and companies involved".

For further information, please contact:
Angus Fire
Fax: +44 1844 265 156
Website: www.angusfire.co.uk

TYCO SERVICES BUILDING PRODUCTS DEVELOPS SUPER FIRE DOOR FOR MALAYSIAN MARKET

Tyco Services Building Products has developed a fire door to meet Malaysia's stringent industry standards using 100% Australian sourced materials and technology. After testing the door local Malaysian authorities and manufacturers were astounded with the results.

Malaysian standards are considered more difficult to pass than Australian or British standards as Malaysia require a minimum of sixty minutes insulation making it twice as high as Australian standards. Tyco Services Building Products new fire door not only met the Malaysian standard (1073:Pt 3 1996) but, was also found to be half the weight of the locally manufactured doors and can be constructed much faster.

After the successful testing at Malaysia's testing authority Sirim, Tyco Services Building Products are now working to establish an exclusive agreement with an agent in Malaysia who has three well known fire door manufactures lined up to distribute the Tyco Services Building Products door to.

In the interim the door is known as the HD E Core (HD referring to high density). The HD E Core fire door is suitable in Malaysia for all high rise residential unit entry doors, public buildings and anywhere that fire protection is required such as hospitals, shopping centres, cinemas and educational institutions.

For more information please contact:
Tyco Services Building Products
Tel: +61 2 9938 5499
Website www.tycobp.com.au

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For over 50 years, **EATON Corporation** has been an industry leader in Fire Pump Controllers and is pleased to announce the release of the Cutler-Hammer FDAP-M Microprocessor Based Remote Alarm Panel.

The DFDAP-M Diesel and FDAP-M Electric Remote Alarm Panels have been redesigned as microprocessor-based units, and accept both supervisory and backup supply voltages from 110 to 240 volts, 50/60 Hz.

Each unit comes equipped with seven user selectable alarm inputs and seven 8A/250VAC outputs as well as a DPDT common alarm output.

All models feature a lamp test button which simultaneously test all lights and the audible alarm buzzer. DFDAP-M/FDAP-M Microprocessor Based Remote Alarm Panel

For further information, please contact:
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Fax: 403-948-6967
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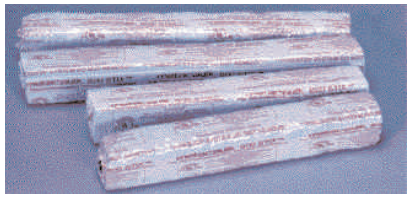
A NEW FIRESTOP SPECIFICALLY DESIGNED FOR THE TELECOMMUNICATION INDUSTRY



RectorSeal announces its latest addition to its Metacaulk® line of firestopping products – Metacaulk® Bixi Stix™!

An extremely cost effective Firestopping material, Metacaulk® Bixi Stix™ functions as an effective intermediate fire-break within vertical cable tray runs. This highly intumescent material is specifically designed for the telecommunication industry. Metacaulk® Bixi Stix forms a high insulating char under fire conditions to prevent the passage of flame, smoke, and hot gases through concrete floors.

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Founded in 1937, RectorSeal® has grown steadily over the years through a commitment to providing high quality products and services. With a diversified business strategy, the company is aggressively pursuing new and unique technologies to serve the plumbing, hardware, heating, air conditioning, and construction markets both domestically and internationally. RectorSeal® is devoted to providing innovative quality products supported by strong customer and technical service.

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SMOKE ASPIRATION TECHNOLOGY FROM SECURITON SWITZERLAND

Since 1948 Securiton develops and manufactures a large range of different fire detection systems to fulfill broad customers' needs from tunnels, commercial buildings, industries, telecommunication, utility stations and others.

The VdS approved ASD Aspiration Smoke Detection System is an effective, yet flexible solution for customers who demand early fire detection. Whether in room or object monitoring, one Aspiration Smoke Detector can run up to 100 m of pipe with up to 20 suction holes. Highly sensitive detectors enable earliest fire detection.

Unique features of ASD 516:
Double detectors per system, ensure accurate detection results and best safety redundancy. This feature is useful especially when the ASD system is linked to automatically released extinguishing systems.

A smoke level indicator indicates the smoke concentration and freely programmable outputs are available for triggering 3 pre-alarm signals accordingly. These pre-alarm outputs can be used to activate a data backup process to prevent loss of valuable information on servers, or can activate other pre-alarm sequences.

Up to 6 remote detectors can be added to one ASD system. Installation of up to 6 detectors inside the pipe network enables individual recognition of zones or objects. The remote detectors can be mounted directly on the equipment to ensure the shortest smoke traveling distance, and give individual identification for each monitored item.

For more information, please contact:
Securiton
www.securiton.ch
or e-mail to export@securiton.ch

NEW SUPPRESSION SYSTEM FIGHTS FIRES WHERE THEY START

A reliable yet low cost automatic fire detection and suppression system designed for confined spaces that fights fires where they start is the latest innovation from Wormald.

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Because it is self-activating, and does not require electrical or other external power sources and because it eliminates expensive piping and nozzle installation- Fire Trace is highly cost effective.

The FireTrace® Modular Carbon Dioxide Fire Detecting and Extinguishing System is designed to comply with the requirements of AS 4214 but it is only with proper installation, testing and regular maintenance that correct operation is ensured when a fire emergency occurs.

The eight companies involved in the re-branding include; Mercury Engineering, Metropolitan Fire Systems, Simplex, Tyco Fire Equipment, National Fire & Security, Automatic Fire Services, Tyco Emergency Evacuation Procedures and Fire Control (service division only).

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SecuriPro® Compact, the new fire detection system of Securiton is suitable, above all, for small and midsized objects. In view of its special functionalities, this compact system is also able to fulfil complex demands. SecuriPro® Compact has a limit of two detector loops, using the SecuriLine® communication protocol. The two loops can run up to 254 participants – detectors and modules can be connected. Of course the complete SecuriStar® fire detector range can be connected to SecuriPro® Compact, namely the new combined smoke and heat detector STD 531 as well as the proven scattered light smoke detector SSD 531 and universal temperature detector UTD 531. That includes all special fire detectors like aspiration smoke detector ASD 516, linear heat detector ADW 511 or explosion proof detector Ex-i. Apart from the hardware, a new configuration software is available: SecuriWin Easy. This software stands out for commissioning the main control unit with a normal PC in a Windows environment without any special tools, and enables the installer to work with his usual PC. The program is set up in a way that all possible system components of the compact system are listed and can be chosen in the screen-work-sheets according to the actual system layout. Within these screen-work-sheets, only the assignment and the function have to be chosen and confirmed. SecuriPro, Compact requires minimal investment in training, system design and commissioning, which results in a very fast and cost effective handling by the technical staff.

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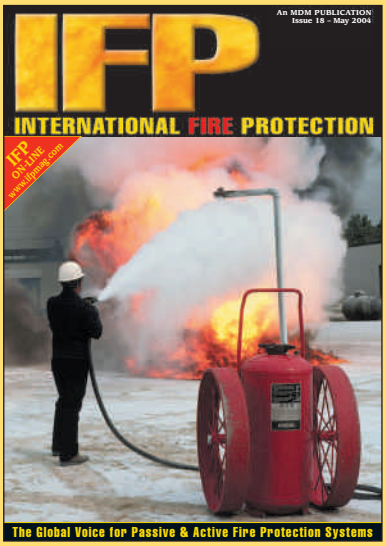

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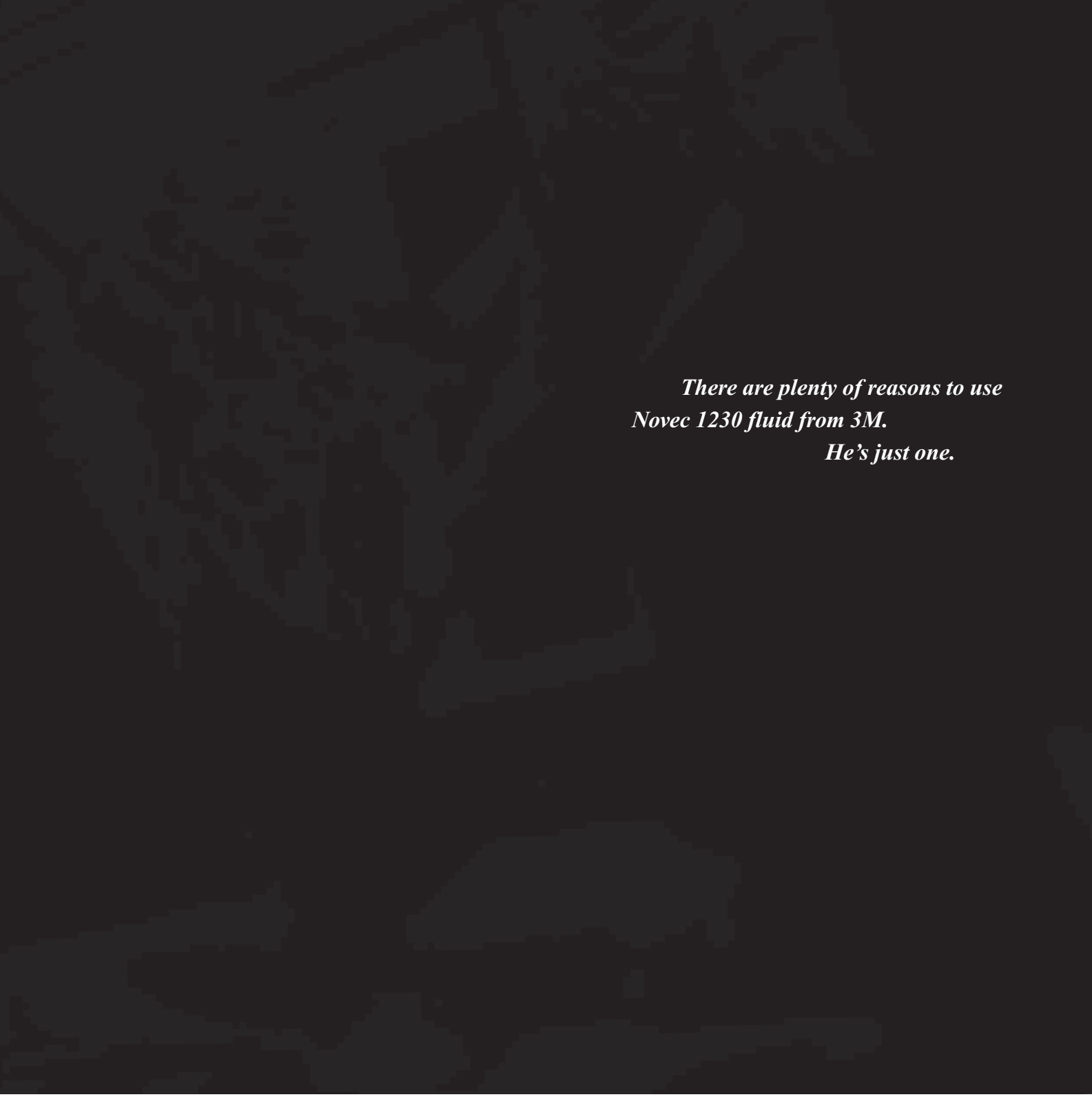

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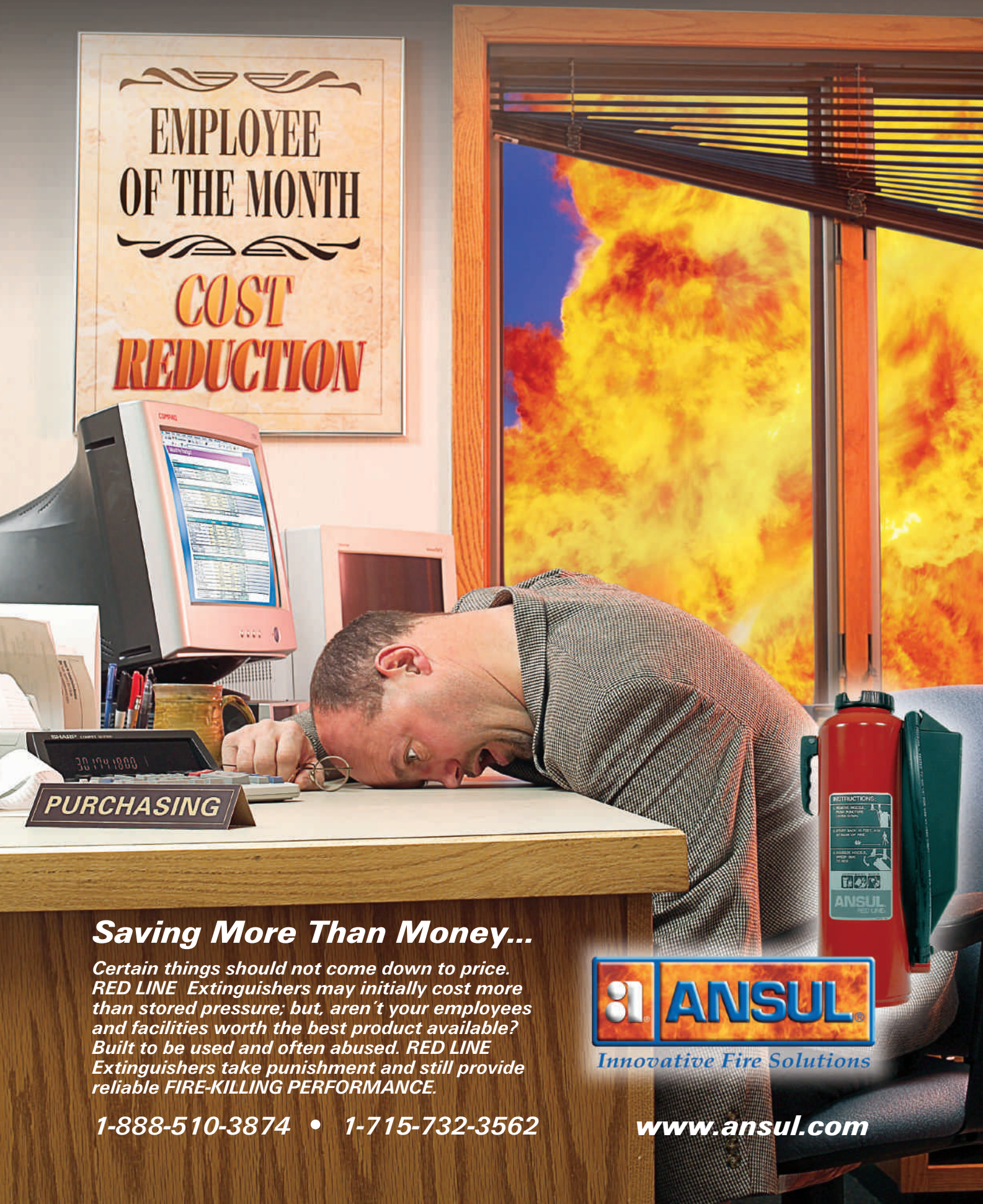

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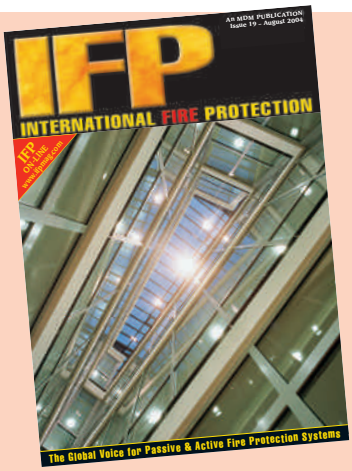

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Co_2 fixed systems – a resilient, viable option

By Doug Pickersgill

10 tonne capacity, centralised bank of (low pressure) CO_2 used to protect #12 separate risks within an Electronics Manufacturing Plant in Taiwan

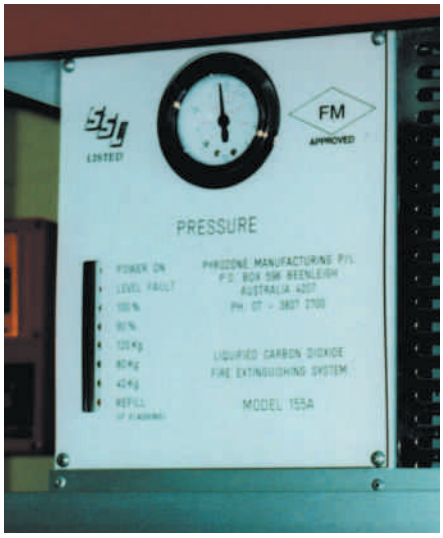
AS A PARTICIPATING MEMBER of both NFPA2001 and NFPA750 Committees I've been in close touch with the emerging new clean agents and water mist systems – in fact have used most of these technologies for our clients. However for someone who 'cut their teeth' on CO_2 it still gives me considerable satisfaction to see a well engineered CO_2 fire suppression system brought on line.

History shows there was the pre-Halon era when carbon dioxide (CO_2) was the primary flooding and streaming agent. Then with the introduction of Halons, CO_2 lost out to that panacea of extinguishants. Now with halons no longer acceptable for environmental reasons, CO_2 is enjoying renewed recognition and acceptance amongst the ever-increasing plethora of gaseous technologies and changing market needs.

From a fire/risk engineering standpoint, I consider CO_2 to have the lowest 'prone to failure' rating of all the present options.

It is worth noting that investment in R&D of CO_2 system technology continues today. Companies of the standing of **Ansul, Pyrozone, Kidde** and **Chemetron** have released enhancements to both low pressure and high pressure programs, improvements that deliver measurable benefits in areas of safety, remote monitoring, (on-site) agent reinstatement and nozzle performance.

Whilst carbon dioxide is a Global Warming substance, as a fire extinguishant it rates favourably from an environmental perspective compared to the 'manufactured' alternatives, is clearly the most affordable and readily available agent and, in my opinion, the most 'predictable and forgiving' to apply.

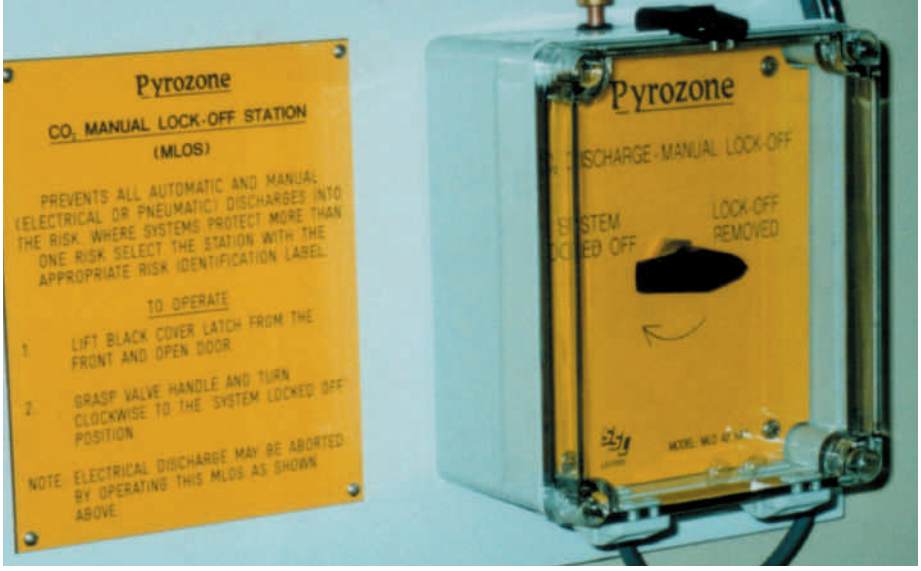


Continuous 'fault' monitoring, including CO_2 contents, when reported to the F.I.P. and beyond, improves reliability and negates the need for regular surveillance

Greatest resistance to its use stems from a concern for personal safety as at extinguishing concentration levels. It can be lethal!

Australian Standards, internationally recognised as amongst the better codes available in this industry, conducted a review of the CO_2 standard as part of developing a new suite of standards (AS4214), released in 1995, covering most of the clean agents developed to fill the gap left by Halons. That review resulted in several new requirements for CO_2 including the introduction of 'Lock Off' valves – effectively a fail-safe means of preventing or interrupting a discharge into any risk area. When combined with the improved detection, control and alarm systems now available, CO_2 can be delivered with levels of safety to satisfy most special hazard requirements – certainly for normally unoccupied risks where systems can be isolated for maintenance and other purposes.

Another safety related issue that must be addressed from the outset is providing for the removal of any CO_2 left in the risk or adjacent areas after a discharge. This particularly applies if there



One manufacturer's approach to improving safety of CO_2 systems with "Manual Lock Offs" – preventing a discharge under any conditions

are basements, lift shafts or trenches where the heavier than air agent can accumulate to dangerous levels. The combination of a portable CO_2 'monitor' and permanent or portable air handling equipment will usually provide an effective solution.

It is interesting to note that by never embracing Halons Germany has continued to use CO_2 protection for a wide range of applications, including occupied risks. Their philosophy is based on fire community acceptance of disciplined adherence to – using only high quality 'approved' equipment; specific system design criteria, including time delays; use of certified installers; training of personnel in evacuation procedures; commissioning of systems before putting into use; and maintenance programs based on quality assured practise. There is no less concern in Germany for safety by OH&S underwriters or corporates – than in other countries, but they appear more adept at managing the risks to acceptable levels.

The British also have a fine record with using CO_2 – reflected in Section 3.2 of BS5306, which states – "the historical evidence from over 100,000 CO_2 systems installed in the past 50 years shows that CO_2 can be used safely".

Australia was the first nation to embark on Halon removal during the 1990s, resulting in only limited 'essential use' installations remaining today. This government-inspired initiative gave rise to a sea change in risk evaluation and engineering solutions for special hazard applications in particular.

Low pressure CO_2 technology emerged as a viable option for replacing many existing Halon systems due to its potential for re-using existing Halon 1301 pipework. This feature can underwrite significant cost savings by reducing or even eliminating down time for what are by definition, fully operational facilities.

In Australia we saw this technology being widely used to replace Halons for power generating and distributing utilities in particular to protect **turbines, switch rooms, control rooms** and similar **electrical risks** in network **substations.**

With the trend away from protecting computers perse and toward **mission critical equipment in** Internet service provider, telecommunication and other facilities, the versatility of CO_2 once again comes into consideration. One Australian manufacturer has pioneered the development of refrigerated **mini-bulk** storage of CO_2 in liquid form. This concept combines the best features of the larger bulk tanks (refilling in-situ, partial-multiple discharges, lower pressure) with the best aspects of traditional high pressure cylinder based systems (modular design, off the shelf packages, factory QA), resulting in a more user friendly format requiring less space and lower maintenance.

These more flexible systems are finding ready acceptance in **IT, semi conductor** and other **high-tech industrial** applications where large centralised storage systems are providing protection for multiple, decentralised risks up to 300m-400m away. No other gaseous technology offers this level of flexibility and performance.

'Thermal Shock', once a concern with CO_2, is not a threat to today's electronic equipment, which has the ability to withstand rapid temperature change and most other environmental demands. Also, improvements in nozzle design have reduced potential for 'dry ice' formation during a discharge through clever dispersement characteristics that prevent sublimation.

Carbon dioxide – 'the original clean

This new CO_2 flooding nozzle from Pyrozone Manufacturing produces a 'wide angle' delivery, without the use of a cone, minimising 'dry ice' formation

> *In Australia we saw this technology being widely used to replace Halons for power generating and distributing utilities in particular to protect turbines, switch rooms, control rooms and similar electrical risks in network substations.*

“Carbon Dioxide has safely extinguished more fire than any other gaseous extinguishing agent”

**Reprinted with permission from NFPA Fire Protection Handbook, 18th edition, copyright 1997, National Fire Protection Association, Quincy, MA 02269, USA.*

Based on a design philosophy using a centrally located 11 Tonne capacity LP-CO_2 storage system, 12 separate risks are protected at a Toppoly Electronics facility in Taiwan. A major engineering achievement was ensuring a trouble-free discharge in protecting a 5000m^3 electrical switch-room located well away from the central storage area.

Just as we accept the use of high voltage electricity in our homes and workplaces and the practice of flying 12km above the earth, so too can carbon dioxide (CO_2) fire protection be engineered to provide high standards of safety in protecting a wide range of industrial, commercial and marine risks.

Pyrozone Modular Low Pressure Systems have been developed to deliver carbon dioxide fire protection to the highest possible safety levels from reliable, proven technology.

Pyrozone Systems can be charged in-situ, contain a patented electronic self-monitoring capability, require less floor space than cylinder based products and empower the fire professional through greater design flexibility. Pyrozone systems employ a fail-safe lock off mechanism.

These and other features result in a substantially lower “Cost-of-Ownership” profile.

一如我们采用高压电力传送网于日常工作及生活上，又或乘飞机翱翔于离地面12公里高的上空中，二氧化碳灭火系统也可被设计成提供极高安全水平的系统，并保护一系列包括工业、商业及船舶的防火应用上。

拍火龙低压力二氧化碳灭火系统，通过其产品的可靠性及超卓生产工艺，已发展成为现时最高安全标准的系统。拍火龙系统能够在原来安装位置进行就地充气，并附有专利设计的自我检测系统，比较其它普通钢瓶系统占用更少面积，使消防专业人员在设计上更具灵活性。而且，拍火龙更能配上一套极高可靠性能的紧急手动关闭系统装置。

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가정이나 직장에서 고압 전기가 사용되고 지상 12km 상공에서 항공기가 비행하는 것이 당연하듯, 산업플랜트와 민간건물 및 해상의 화재위험구역을 방호하기 위해 CO_2 소화설비를 엄격한 안전기준에 따라 설계하는 것 또한 당연합니다

Pyrozone모듈형 저압식 CO_2 소화설비 시스템은 현장에서 입증된 신뢰성 높은 기술을 바탕으로 최고의 안전기준에 따라 화재를 소화할 수 있게끔 개발되었습니다. 탱크로리차로 현장에서 바로 충전할 수 있고, 저장가스량을 자동측정하는 전자장치로 충전량을 언제나 확인할 수 있으며, 많은 양을 저장할 수 있고 미려한 탱크형으로 저장면적이 대폭 줄어들고, 예비가스량도 충전하는 등 설계를 다양하게 할 수 있습니다. 이제 CO_2 소화설비가 필요하는 곳이면 어디든 경험과 기술을 겸비한 SHE한테 연락해 주십시오.

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CO_2 protection has been recognised throughout the world by traditional (high pressure) cylinder based systems

agent', can be discharged without creating any expensive residual clean up problems. This characteristic when combined with its affordability and efficient on-site refilling, in the case of low pressure CO_2 equipment, allows the fire professional to conduct full scale commissioning tests. There is no substitute for a full-scale commissioning test – which will confirm, or otherwise, the integrity of the entire system – i.e. detection, mechanical, electrical, pipework, and the interface with air handling equipment. I never cease to be amazed at the number of systems that fail a preliminary test, even after thorough preparation, leaving me in no doubt as to the justification for recommending (to my clients and their underwriters) this 'added' expenditure!

Whilst 'total flooding' represents the majority of CO_2 applications, 'local applications', whereby the agent is trained onto a given risk, is a highly effective technique. This approach is widely used in the **automotive, printing** and other **processing industries** where stand-alone items of equipment or processes are not 'contained' within walls to allow flooding techniques to be adopted.

Given there is so much information and knowledge available on the delivery and extinguishing performance of CO_2, an experienced fire professional can employ this proven technology to obtain a variety of outcomes. We recently utilised the 'Open Pit' design guidelines contained in NFPA12 to protect two '**simulators**' housed in a large **training centre** – where pressurised hydraulic control lines pose a risk of fire should one rupture and flail fluid onto high temperature bearings. Through careful positioning and direction of nozzles it was possible to control the heavier than air agent to produce the desired design concentration up to a predetermined height – i.e. a theoretical ceiling level!

In addition to the applications referred to so far, there are much other Class A, B or C fires that can be addressed with either automatic or manual protection based on CO_2. These include **coal silos, quench tanks, semiconductor wet benches, computer room sub-floors, commercial fryers, spray booths, archives, MCC rooms, battery storage rooms, hose reel stations plus the traditional marine applications**, i.e. **engine rooms, cargo spaces** and **paint lockers**. Add to this, **inerting** applications and you have a truly versatile, proven extinguishant at your disposal.

Whilst presenting this commentary on the viability of CO_2 for today's market, we cannot overlook the importance of ongoing and regular maintenance of the completed installation. My consulting practice has invested heavily in the development of detailed maintenance programs for our clients as, without such programs, we could not justify recommending their original investment in high quality products, commissioning tests and staff training.

We recently implemented a maintenance program for Porgera Mines in New Guinea providing our client with daily maintenance schedules complete with question an answer/confirmation sheets for operators and covering every aspect of fire protection at this remote site. I'd like to tell you more about this program, maybe in the next issue of APF!

There is no substitute for a full-scale commissioning test – which will confirm, or otherwise, the integrity of the entire system – i.e. detection, mechanical, electrical, pipework, and the interface with air handling equipment.

Doug Pickersgill was born in St George, Queensland, Australia. His entire working life has been spent in the fire protection industry starting as a cadet engineer with the Wormald Group in Australia. During a career spanning 40 years, he has lived and worked in Japan, USA, Mexico, Brazil and England where he was involved at the 'sharp end', developing innovative design philosophies and technical solutions to protect unorthodox and special hazards.

Continuous involvement with the Power Generating, Petroleum, Mining, Marine, Defence, Telecommunication and Transport industries has resulted in a unique understanding of risk management and loss prevention best practice across these areas.

Doug Pickersgill is credited with being one of only two non-US citizens invited to contribute to the development of NFPA2001, the most widely used standard covering the introduction of new 'clean agents' following the demise of Halon gases, and NFPA750, a standard dealing with emerging 'water mist system' technologies.

Doug Pickersgill is the Principal of Fire & Safety Systems (FSS), an Australian consultancy that attracts clients who are owners of high value and often unusual risks needing to be protected against fire, a challenge FSS thrive on. (www.f-ss.com.au)

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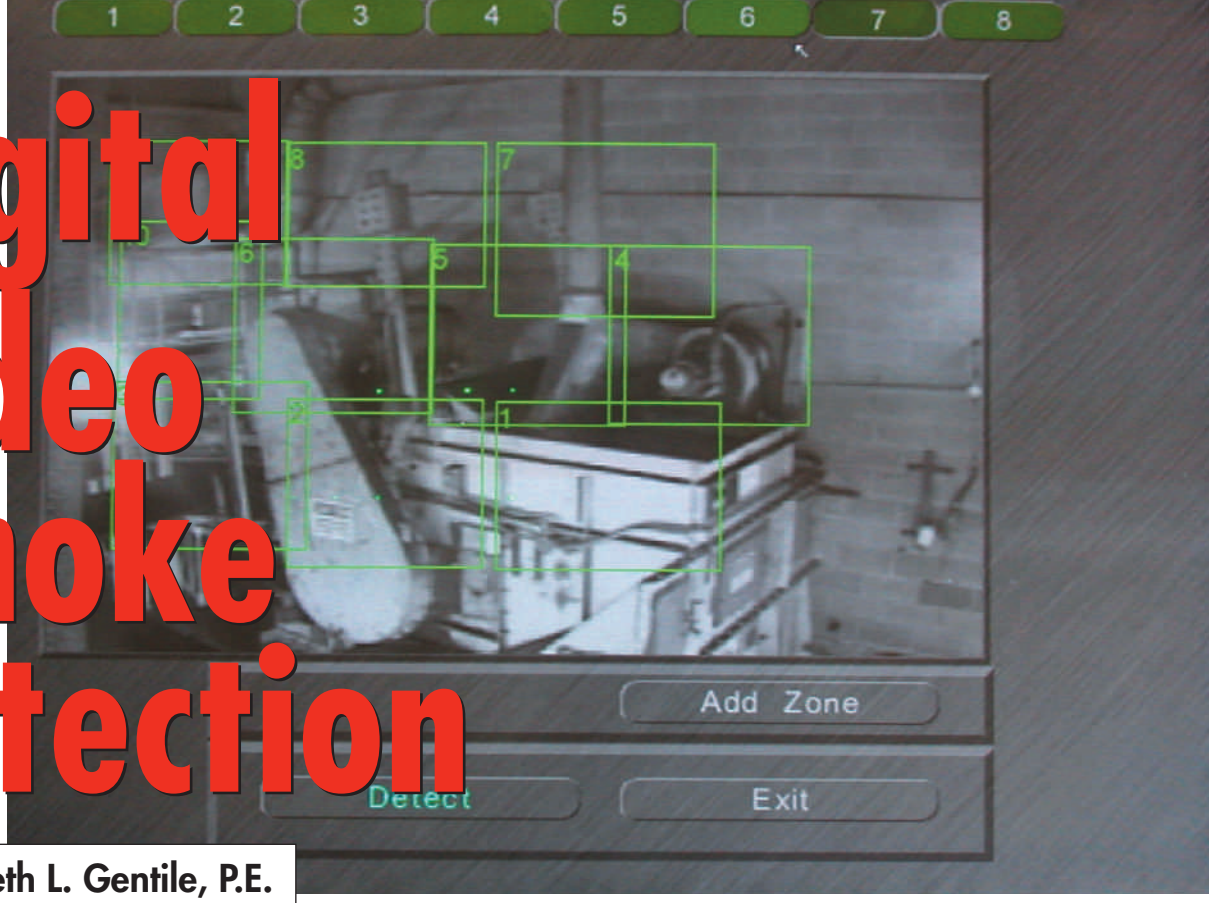


By Kenneth L. Gentile, P.E.

Figure 1 Photograph courtesy of Midwest Generation-Peoria IL; and Fire Sentry-Brea, Ca

Using CCTV for Smoke Detection

UNLIKE SOME TECHNOLOGIES that evolve gradually, automatic fire and smoke detection mutates in a series of distinct, innovative steps. These innovations continue to change the methods for sensing the presence of a developing fire; for analyzing data at detectors and for transmitting situation conditions to responding personnel. Examples of conventional detecting methods include, various thermal elements (heat); photoelectric, ionization, and aspiration (smoke); and Ultra-violet/Infra-red (flame). Examples of analytical improvements include the development of analog thermal sensors in lieu of bi-metallic or fused element heat sensors and analog evaluation of smoke levels by the detectors. Transmitting conditions has improved considerably with the specific device locations (addresses) and enhanced LCD (liquid crystal diode) and CRT graphic displays. Each of these innovations has impacted the fire alarm market, installation methods and code requirements to varying degrees. Now another new development, digital video smoke detection, provides a radical, new option in automatic fire detection.

Digital video smoke detection (DVSD) is the coupling of Closed Circuit Video Cameras (commonly known as CCTV) with innovative, motion-sensing software to detect the presence of smoke. The concept is quite simple. You or I visually see smoke and; by mental processes, we recognize it as smoke and act to summon aid. In this same manner, the CCTV camera "sees" the smoke, processes the image motion (in a dedicated computer) to recognize the smoke; and activates an alarm.

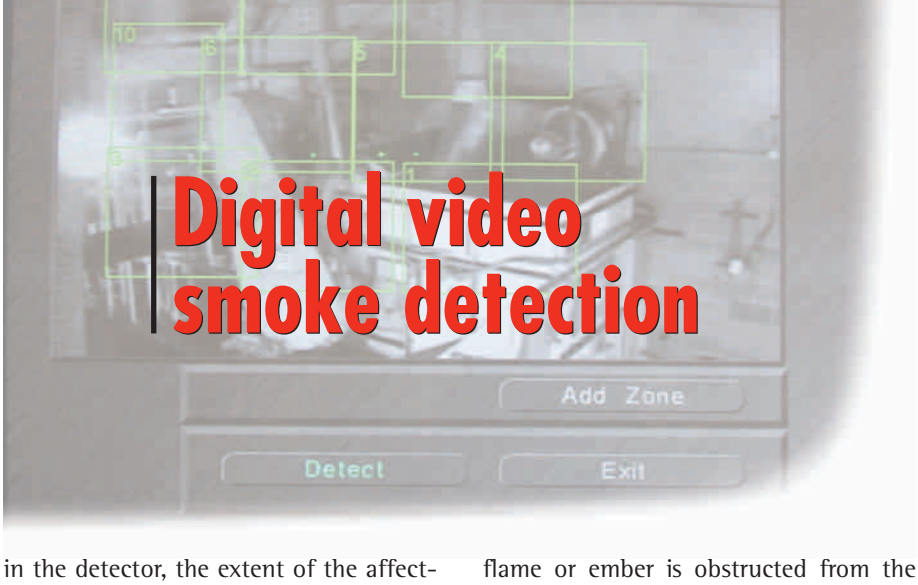
The sections that follow provide a basic understanding of the system and its implications for potential end-users of DVSD. A comparison of the conventional detection methods to DVSD operation is followed by a description of the system equipment requirements. The current DVSD status in the code community and with the listing agencies is discussed. And the final two sections explore benefits and applications; and design and installation considerations.

BASIC PRINCIPLES: CURRENT DETECTION METHODS

DVSD is different from other types of automatic fire detection in its method of coverage, analysis of data and the information available to responding personnel. Consider how it differs from the each of the following types of conventional automatic detection:

- **Photo-electric and Beam**
- **Ionization and Cloud Chamber**
- **Heat (Temperature Change)**
- **UV and IR Flame**

Photoelectric, "spot" type, smoke detectors are in common use because of their adjustable sensitivity, economy and have become must less prone to nuisance alarms due to technological improvements of the past decade. Photoelectric Beam detectors have applications in high ceiling and open areas. Both of these detectors rely on the migration of smoke into the path of a laser. In the spot detector, the light beam is internal to a chamber in the detector head while the beam detector transmits its light beam across the coverage areas. The obstruction of the beam affects the electrical settings



Digital video smoke detection

in the detector, the extent of the affected settings is then interpreted by firmware in the panel or detector itself.

Similarly, ionization type "spot" type smoke detectors and cloud chamber detectors must rely on the migration or inhalation of smoke. For these detectors the particles of combustion react with ionized particles in an internal chamber to affect the detector's electrical. The resulting change in electrical settings is also interpreted by firmware in the panel or detector itself.

Automatic heat detection can be a simple sprinkler, thermal element device or sophisticated analog temperature sensor. The simpler devices have mechanical elements that change the state of electrical contacts when deformed by heat and the more sophisticated devices use temperature-sensitive electronics to report the temperature at the detector. In order to activate either type of mechanism, heat from a fire must migrate to the detector.

Ultra-violet (UV)/Infrared detectors are electronic sensors that pick up energy with those frequencies of the photo-radio spectrum emitted by a spark or a flame. This results in rapid response as neither heat nor smoke must move to the detector, but the detector must have a direct line-of-sight with the flame, spark or ember. The detector's electronic logic then provides a change of state to electrical contacts that are often connected by addressable monitoring modules to a fire alarm system.

BASIC PRINCIPLES: DVSD

One disadvantage of monitoring heat and smoke by the above methods is that the heat or smoke must migrate or otherwise be drawn to the detector. This results in a delay and often the path of the heat or smoke can be obstructed. The UV/IR does not have the disadvantage waiting on the heat or smoke movement, but is unable to activate if a flame or ember is obstructed from the sensor's view. DVSD is not subject to either of these disadvantages.

The basic premise of DVSD uses the same method that you or I would use to detect smoke by sight. By "watching" an area and then recognizing smoke by its visual characteristics, a camera generates the electronic signal of the image in covered area. If the camera is digital, the signal is directly sent to the central processing unit (CPU). If the camera is analog, the signal is converted in an A/D converter and then received by the CPU Software in the CPU then looks for a specific electrical signal pattern that is consistent with the motion of "hot" smoke. Upon recognizing this signal, the CPU generates an alarm condition by both electrical contacts that can be monitored by fire alarm or other equipment and indicating the location of the smoke on a visual monitor for authorized personnel (refer to *figures 1 and 2*).

The concept is the same as security motion detection for CCTV, but the software is more specific and sophisticated in what it identifies. Multiple cameras can be monitored by the same system and the areas under surveillance can be quite large. As can be seen in *figure 1,* the DVSD software provides graphic enhancements to indicate multiple zones (numbers shown along the top of the image) in outlined "boxes" in the camera view. Each zone can be reported as a separate alarm initiating point. Upon identifying smoke, the graphics will indicate the location of the smoke (the red "boxes" of *figure 2*). The response is, in fact, so specific that most programs that programs will identify the smoke location before it is visible on the monitor.

As for false alarm, the programs can distinguish between smoke and steam, fog, or other vapors and only alarm on smoke. As a digital video image, the system programming also permits "pre" and "post" event recording of images on the CPU hard drive. The causes and perpetrators of fire events can be more effectively documented.

THE EQUIPMENT

The "hardware" components are straightforward as illustrated in *figure 3*. A camera is required that meets a specified performance. If an analog camera is used, then a signal A/D converter is required. The centerpiece is a processing unit that includes programming keyboards and data ports. Monitors can be

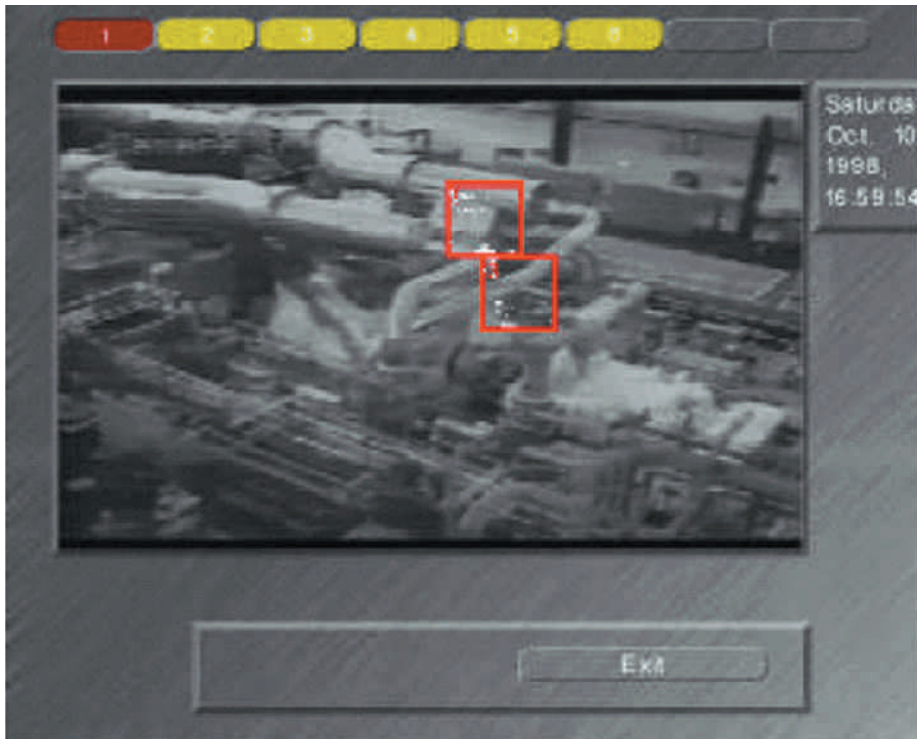


Figure 2

Photograph courtesy of Fire Sentry-Brea, Ca

provided in almost any desired configuration. And finally interfaces to fire alarm systems or other video or automatic building systems.

The software provider will typically provide the industrial grade CPU and one station for operator interface. Often any A/D conversion is included in this CPU. The cameras can be provided by numerous vendors but must meet the software provider's specifications (these are not usually onerous requirements) and sometimes the existing cameras are adequate. Similarly, the monitors should be sufficient to meet the requirements of the responding personnel and are available from many vendors. Devices that interface the CPU with the fire alarm systems, wans, LANs or building automation systems must communicate in the appropriate protocol. The CPU provides an output digital video signal and "change-of-state" contacts for interfacing.

DVSD AND THE CODES

European electric generating plants were the first to seek a solution to early detection of smoldering fires in the large open structures that housed turbines. This use is supplemental smoke detection and is not considered an issue for the regulatory requirements of the model building codes used in the more conventional occupancies. As such, concern with acceptance in the codes that govern occupancies in the United States and other countries were not a priority of the developers. As interest in using DVSD as a smoke detection method where smoke detection is a regulatory requirement, the code and standards bodies of the western hemisphere are considering listing and installation requirements.

In the United States, only one vendor has obtained FM Global approval. Other agencies, such as Underwriters' laboratories do not, as yet, have listing methods. The National Fire Protection Association, responsible for *The National Fire Alarm Code* (NFPA 72), is presently considering proposals to permit DVSD as an acceptable smoke detection in the 2006 edition. For the present, however, DVSD can only be used as a substitute for recognized automatic and smoke detection methods where specific permission is received from the local authority having jurisdiction. Even with the FM Global listing, pending adoption by NFPA, installation usually requires acceptance of a formal request for a variance or waiver.

Devices that interface the CPU with the fire alarm systems, wans, LANs or building automation systems must communicate in the appropriate protocol. The CPU provides an output digital video signal and "change-of-state" contacts for interfacing.

Digital video smoke detection

BENEFITS AND APPLICATIONS

With an understanding of the basic operation and the equipment requirements, the number of difficult smoke detection problems that can be addressed by DVSD quickly grows. These include detection in specific environments, differing lighting conditions, and occupancy types that aren't easily covered by the conventional detection methods. Additionally the use of cameras that can cover large view areas and have alternate applications in security systems can contribute to the cost effectiveness of the system.

As the smoke need only be in the camera's view, a camera can be installed in a location that is protected from the area of coverage by glass or special enclosures. This permits using cameras protected from the classified, harsh, or exterior environments that require the smoke detection. One installed application is in a coal crushing facility of a power generation plant. The system provides effective automatic fire detection as enclosures protect the cameras; the wide view range permits coverage of the large open areas; and the software is not affected by dust or fooled by the presence of the none smoke particles.

Another critical characteristic is that the software works as well with "low-light" and infrared cameras as with conventional cameras. Because the movement of smoke generates the same electric signal from a low light or thermal camera image, the software can recognize the presence of smoke in these conditions. This permits use in areas subject to light levels that change as a result tasks, hours of usage, or sunlight. This has resulted in European highway systems using DVSD in tunnels for protection of moving vehicles.

Some occupancy types require smoke detection for which conventional detection is not well suited. Consider a large exhibition hall. As an assembly occupancy, some jurisdictions require smoke management systems to be initiated by automatic smoke or fire detection. The preferred method is to install photoelectric beam detection. Many of the conventions and exhibitions, however, install banners, hanging and floor mounted displays and a variety of floor arrangements that can interfere with both the line of the detector beam and the migration of smoke to the beam. If the hall is large, the large number of spot type smoke detectors required would be expensive and possibly aesthetically displeasing. DVSD cameras can be placed to cover the entire hall and spot the smoke movement no matter what path it takes around obstructions.

In all of the above-described locations, and in most other possible uses for DVSD, the use of cameras for security is increasingly a necessity. Nothing prevents the DVSD camera system from performing double-duty as security cameras. The proposals under consideration by NFPA will, if adopted, will require specific installation methods and monitoring, but the images can still be used for both security and life safety purposes. The digital video output from the CPU (including the camera number, zone, and alarm graphics) can be transmitted just the same as any other digital video signal. The images, while still performing the life safety system functions, can be transmitted to building automation reporting systems, area network infrastructures and by wireless technologies to responding personnel.

DESIGN AND INSTALLATION

Many questions should be answered prior to procuring a DVSD system. These include, but are not limited to:

- Is DVSD the most appropriate technology for my application?
- Is the Facility suitable for DVSD installation?
- How will my staff use and maintain the DVSD system?
- What systems can benefit from interconnection with the DVSD?
- Do I need to address code or listing issues with regulators?

A detailed engineering assessment should be performed to address these and other concerns before any design or purchases. It is during this assessment, that code and standards issues should be broached with the authority having jurisdiction for life safety.

The design of the system requires expertise in fire initiating device coverage and digital video system specification. The camera placement must provide adequate view areas. Placement of the CPU, interfacing system connections, circuits, and other components should comply with standardized supervision and surviv-

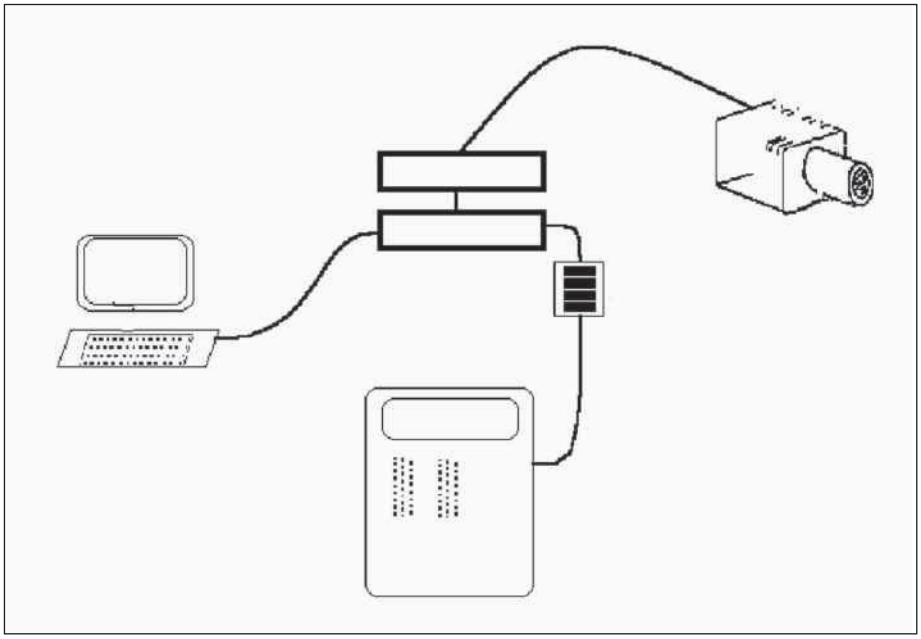


Figure 3

> *As a new technology, designers should work with the installers to provide a detailed and workable preventive maintenance program. If used a part of the life safety building systems, compliant testing and inspection procedures should also be developed.*

ability practices. And the specification of equipment must not only be suitable for the software vendor, but must also perform reliable for the duty and environment of the intended application.

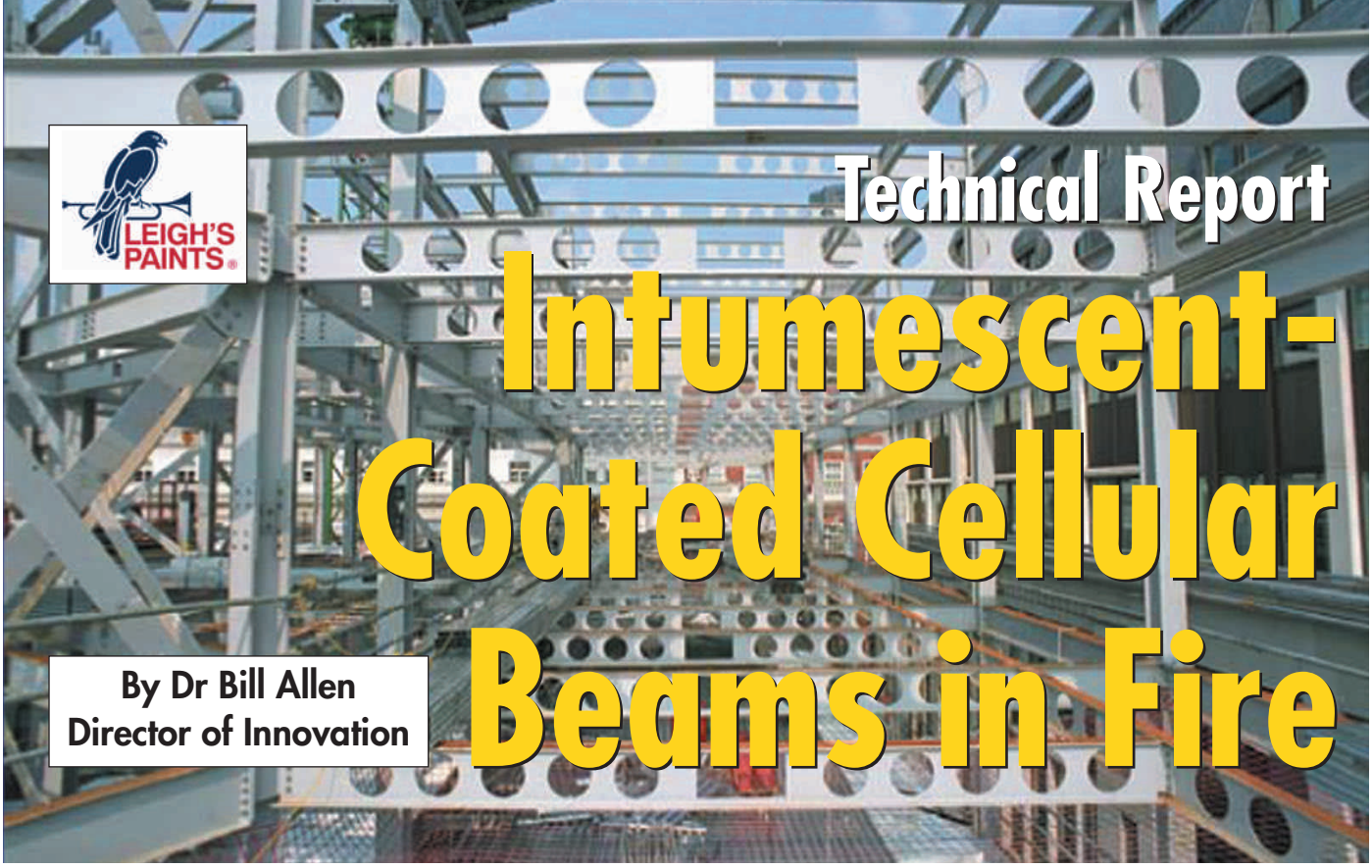
As for procurement, selection of the software vendor is presently limited to only a few providers (of which only one is known to the author to have obtained a listing acceptable to most U.S. authorities). The providers of the components and installation, however, should be limited to only qualified digital video contractors and manufacturers. In the wide-open arena of video installation, there are shoddy equipment vendors and trunk-slamming contractors who offer installations "too good to be true". Construction documents should provide enforceable specifications and layouts, as well as qualification requirements for installing contractors.

Finally, as a new technology, designers should work with the installers to provide a detailed and workable preventive maintenance program. If used a part of the life safety building systems, compliant testing and inspection procedures should also be developed.

FUTURE CONSIDERATIONS

DVSD is a technology that offers solutions to a continually growing number of challenges stemming from the need for pervasive digital video in point-of-sale, surveillance, access control, asset protection and other applications. Since digital video often competes for the same resources as do the life safety systems, DVSD is uniquely suited as a multi-task tool. Also, the Twentieth Century analog video systems are rapidly being replaced by digital video. The new systems must be engineered to accommodate enhancements, such as DVSD, to minimize rapid obsolescence and to reduce system life-cycle costs. Finally, the images and information that DVSD can transmit, improves the ability to remotely evaluate an incident and to remotely reconnoiter a facility in crisis. That we must provide detailed information to our responding personnel, before they enter a site, is one of the first, and most painful lessons learned for life safety in the Twenty-first Century.

Kenneth Gentile is a Professional Engineer and Senior Consultant in the Houston Office of Rolf Jensen & Associates. Mr. Gentile can be reached at kgentile@rjagroup.com.



Technical Report

Intumescent-Coated Cellular Beams in Fire

By Dr Bill Allen
Director of Innovation

Pic courtesy Leighs Paints

IT REQUIRES LITTLE ENGINEERING skills to understand that the structural strength of a steel beam is directly related to its mass and dimensions.

Steel also rapidly begins to lose its structural strength when it reaches temperatures above 400°C, and by the time it reaches 550°C it will have lost about 40% of it's load bearing capacity. The larger the steel mass, in proportion to it's perimeter exposed to heat, then the longer it will take to reach high temperatures in a fire.

This parameter is known as section factor or HpA, which is the heated perimeter of a steel section divided by it's cross sectional area. In a nutshell the smaller this value then the heavier is the steel section, which thus takes longer to heat up in a fire.

The Building Regulations for England and Wales, Approved Document B (AD-B), states "The building shall be designed and constructed such that, in the event of a fire, it will maintain its stability for a reasonable period". Reasonable periods are also defined in AD-B, and depend on the building height and its end use.

In order to remain stable for these fire resistance periods, structural steel requires the use of insulating material to reduce the rate of heating of the steel in a fire. One of the more aesthetically desirable forms of insulation is Intumescent Coating, because it appears to be a traditional decorative coating under normal conditions. However, in a fire the material reacts and swells to form an insulating char providing fire protection to the structural steel.

I would ask the reader to consider, that common sense rather than great engineering expertise dictates, if holes are cut into a web then both the structural strength and the mass of steel are reduced.

CELLULAR BEAMS

In recent years it has become common engineering practise to use beams with openings in the web to allow the passage of services through the section rather than underneath. There are many advantages in using what are commonly known as cellular beams, which do not need to be discussed in relation to this report.

I would ask the reader to consider, that common sense rather than great engineering expertise dictates, if holes are cut into a web then both the structural strength and the mass of steel are reduced. Therefore it is reasonable to assume that the beam with holes in the web will require more fire protection than a similar beam with no holes, to maintain the same level of fire protection.

Historically, guidance for the fire protection of cellular beams has been given in both BS5950 Part 8, and in the ASFP (Association for Specialist Fire Protection) 'Yellow Book', Fire protection for structural steel in buildings.

The guidance in the 'Yellow Book' has however only been in relation to the use of other passive fire protection materials such as sprayed insulation or insulating boards. This gives an empirical rule for calculating the passive fire protection thickness to be applied to castellated or cellular beams by taking the thickness required for the parent beam with no holes and increasing it by 20%.

The SCI Guidance Note P160 and BS5950 Part 8 has in the past referred to the '20% Rule' being applied to intumescent coatings. Part 8 did not say that the 20% rule could be applied to intumescents, but also did not say that it couldn't. The new Part 8 is explicitly relevant to passive protection systems only.

The fire protection industry had by inference applied this same rule when using intumescent coatings for cellular beams without any actual fire test evidence to support this.

This practise had however become accepted by all industry parties, i.e. manufacturers, contractors and engineers.

FIRETEX FB120

Leigh's Paints were invited to develop and supply intumescent coatings as part of a joint venture company Fabsec Ltd. The aim was specifically to develop a material that would provide up to 2 hours' fire resistance on beams with holes in the web. The material would be quick drying and applied in-shop in a single coat.

The end product was Firetex FB120, which is a solvent based single pack thin film intumescent coating designed specifically for the fire protection of fabricated plate girders with openings in the web. These intumescent-coated beams are known as Firebeam.

A series of loaded and unloaded fire tests were designed by the UK Steel Construction Institute (SCI), which were then carried out at Warrington Fire Research (WFRC). WFRC, SCI and Corus witnessed these tests.

The design software (FBEAM) for Firebeam required very detailed temperature mapping on all flanges, webs, around holes and on stiffeners. In order to provide this information many more thermocouples were installed than are normally required by BS476 Part 21 Fire Testing.

Pic courtesy Leighs Paints

In total 7 loaded beam tests were carried out and also dozens of small-scale sections were fire tested to the requirements of BS 476 Part 21.

Over the range of tests the steel thickness ranged from 10-45mm in the flanges and 5-15mm in the webs. The intumescent was applied and tested at thickness ranging from 0.2 to 2.2mm.

Beams were tested with both circular and rectangular holes in the web, with and without stiffeners. In addition, the effect of fire on the closeness and the diameter of the holes were investigated.

The steel strength was S275 and the composite decking was Holorib with a concrete topping. Shear studs fixed the deck.

There were approximately 50 thermocouples attached to each loaded beam to allow for a very detailed thermal analysis of each element of the beam to be carried out by SCI.

The SCI thermal analysis data then formed part of the software package known as FBEAM2. This software allows the engineer to design a beam in the cold state, and then using a database constructed from fire test data, it calculates the amount of Firetex FB120 required to protect the steel section for the required period of fire resistance. The complete fabricated beam plus fire protection is patented and is known as Firebeam.

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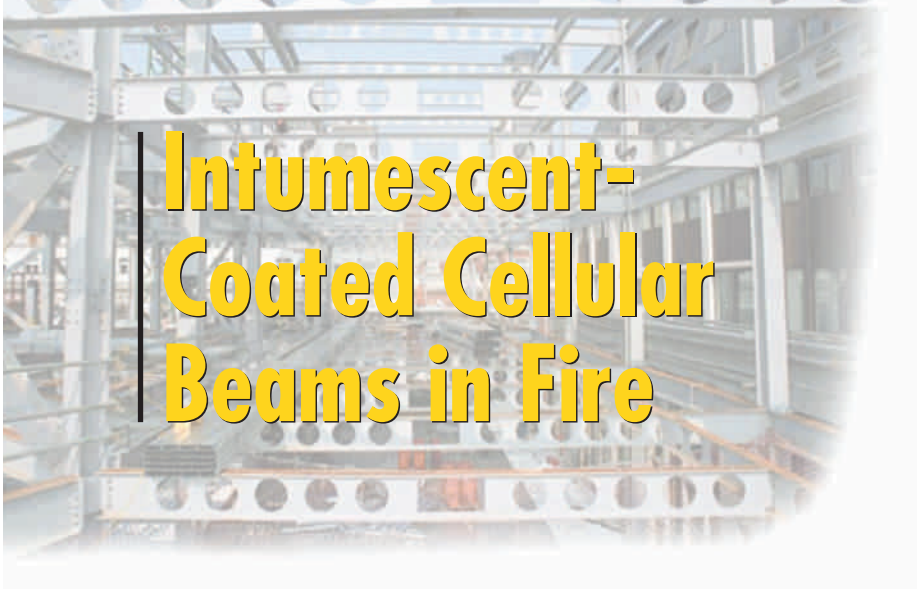
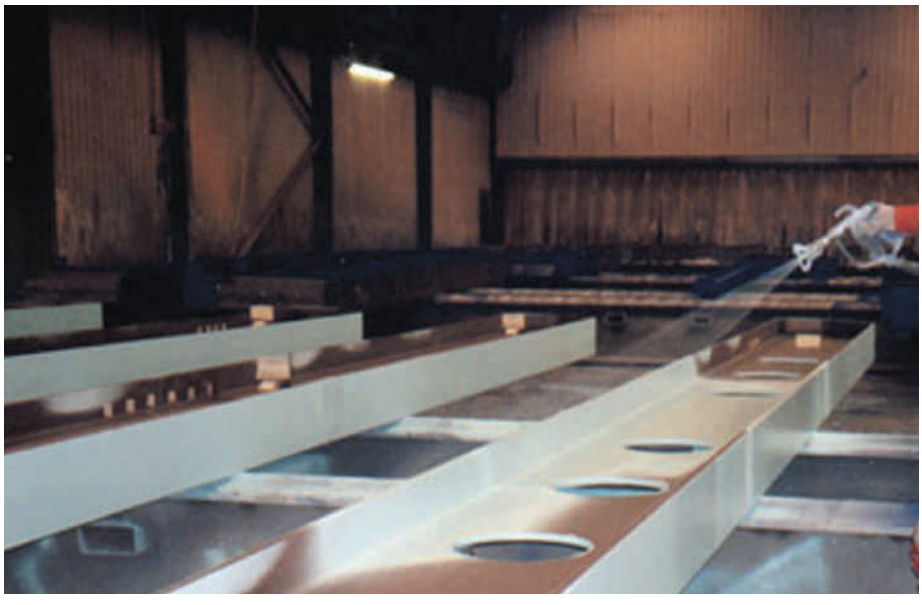


Intumescent-Coated Cellular Beams in Fire

RESULTS SUMMARY

All sections were coated with Firetex FB120, and there was between 2 and 4 unloaded short section beams in each test in addition to the loaded beam.

- **Test 1** – Warres No. 116679 – Date of Test 13/02/2001
  Loaded Beam, with circular openings in the web;
  Load removed after 117 minutes; coating thickness was 1.84mm.
- **Test 2 –** Warres No. 116680 – Date of Test 14/03/2001
  Loaded Beam, with rectangular openings in the web;
  Load removed after 140 minutes; coating thickness was 2.01mm.
- **Test 3 –** Warres No. 116681 – Date of Test 25/04/2001
  Loaded Beam, with ring stiffened, circular openings in the web;
  Load removed after 120 minutes; coating thickness was 1.49mm.
- **Test 4 –** Warres No. 117188 – Date of Test 15/11/2001
  Loaded Beam, with circular, and semi-circular openings in the web;
  Load removed after 57 minutes; coating thickness was 0.58mm.
- **Test 5 –** Warres No. 117189 – Date of Test 21/11/2001
  Loaded Beam, with circular, and semi-circular openings in the web;
  Load removed after 47 minutes; coating thickness was 0.255mm.
- **Test 6 –** Warres No. 127490 – Date of Test 03/02/2003
  Loaded Beam, slender, deep-web, with circular openings in the web;
  Load removed after 80 minutes; coating thickness was 1.4mm.
- **Test 7 –** Warres No. 127491 – Date of Test 06/02/2003
  Loaded Beam, slender, deep-web, with circular, and square openings in the web;
  Load removed after 87 minutes; coating thickness was 1.35mm.
- **Test 8 –** Warres No. 1299500 – Date of Test 03/04/2003
  4 x 2mtr unloaded beams, with a range of steel thickness;
  Circular holes were cut into the webs. The total average coating thickness ranged from 0.83 to 1.56mm.
  The tests were unloaded and arranged to provide supplementary temperature data only.
  The test was discontinued after a period of 100 minutes.



Pic courtesy Leighs Paints

CONCLUSIONS

These fire tests have provided the first independent fire test study of intumescent coating on cellular beams; this has resulted in the SCI withdrawing their support for the use of the 20% rule for intumescent coatings, both from BS5950 Part 8 and its P160 Guidance Document. Fire testing had shown this rule to be un-conservative in some instances.

The fire test results have shown that the amount of additional fire protection increases as the web openings are more closely spaced.

Other important factors have been the size of the holes in relation to the web depth and also the ratio of the web depth and its thickness. These two factors i.e. cell spacing and slenderness ratio will therefore have great influence on the amount of fire protection required.

The SCI have now published interim guidance for the fire protection of cellular beams with intumescent coatings in AD269, and a detailed technical explanation is given in RT983.

Leigh's position is now quite clear, we believe that we have a duty of care to acknowledge that the 20% rule can no longer be universally applied to intumescents.

We are currently using Leigh's Product Calculator to provide cellular beam loadings for all our intumescent coatings, based on AD269.

To support this further Leigh's are also working with other intumescent manufacturers, and interested parties within the ASFP, to devise a standard fire test package for the fire protection of cellular beams.

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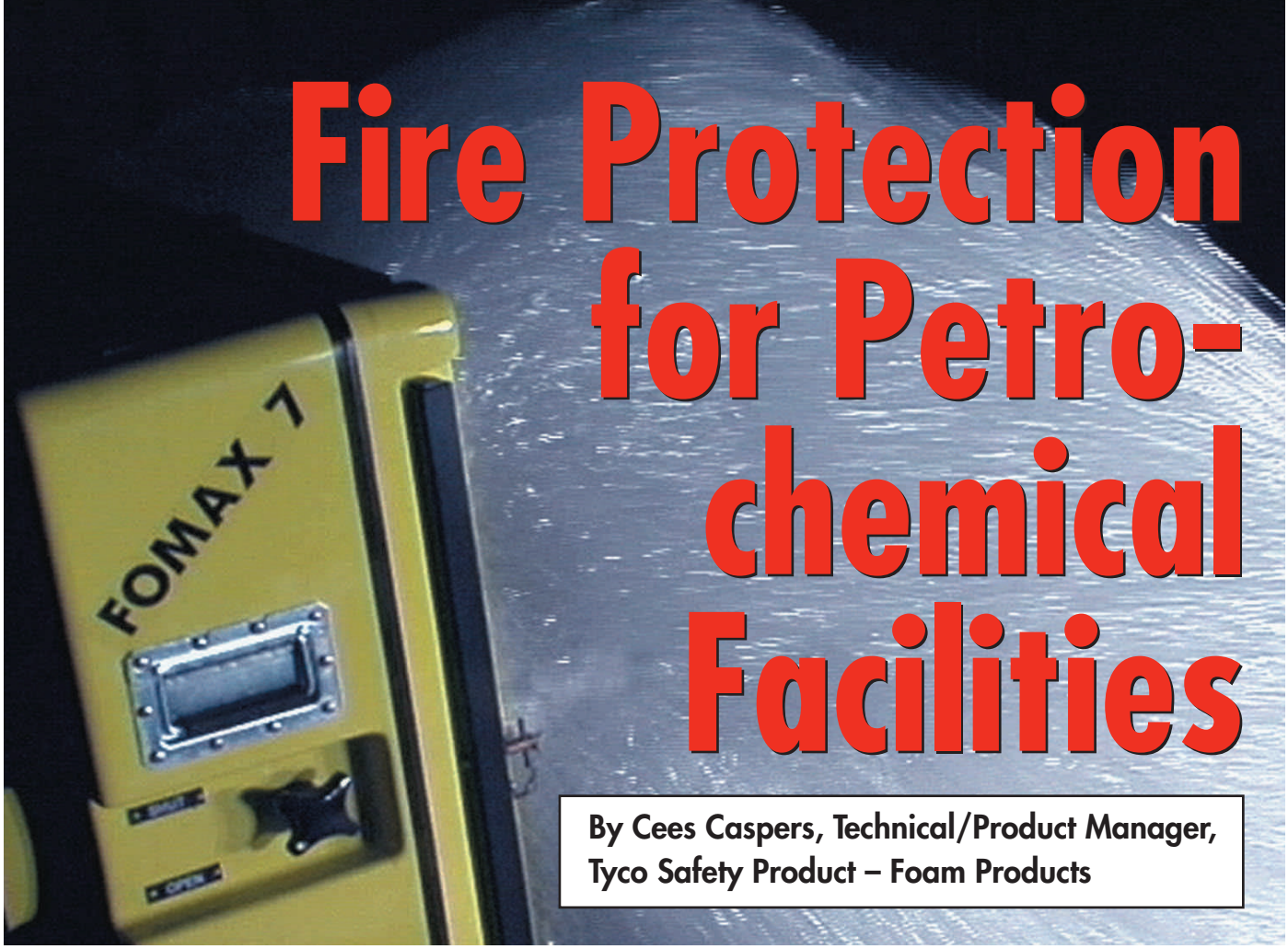
Fire Protection for Petro-chemical Facilities



By Cees Caspers, Technical/Product Manager, Tyco Safety Product – Foam Products

Pic courtesy TSP

FIRE PROTECTION REPRESENTS AN expensive investment to operators of petrochemical facilities but it is an investment. In times of economic and political uncertainty it is vital that businesses continue to make investments to protect business critical assets and processes from the threat of fire. For fire protection specialists, the challenges posed by the oil and petrochemical industries are diverse and it is necessary to gain a full understanding of the clients business and processes before making recommendations. This article explores some of the issues affecting systems design and provides an overview of the merits of fire protection strategies and foam agents currently available to specialists and end users in this sector.

THE NEED FOR RISK ASSESSMENTS

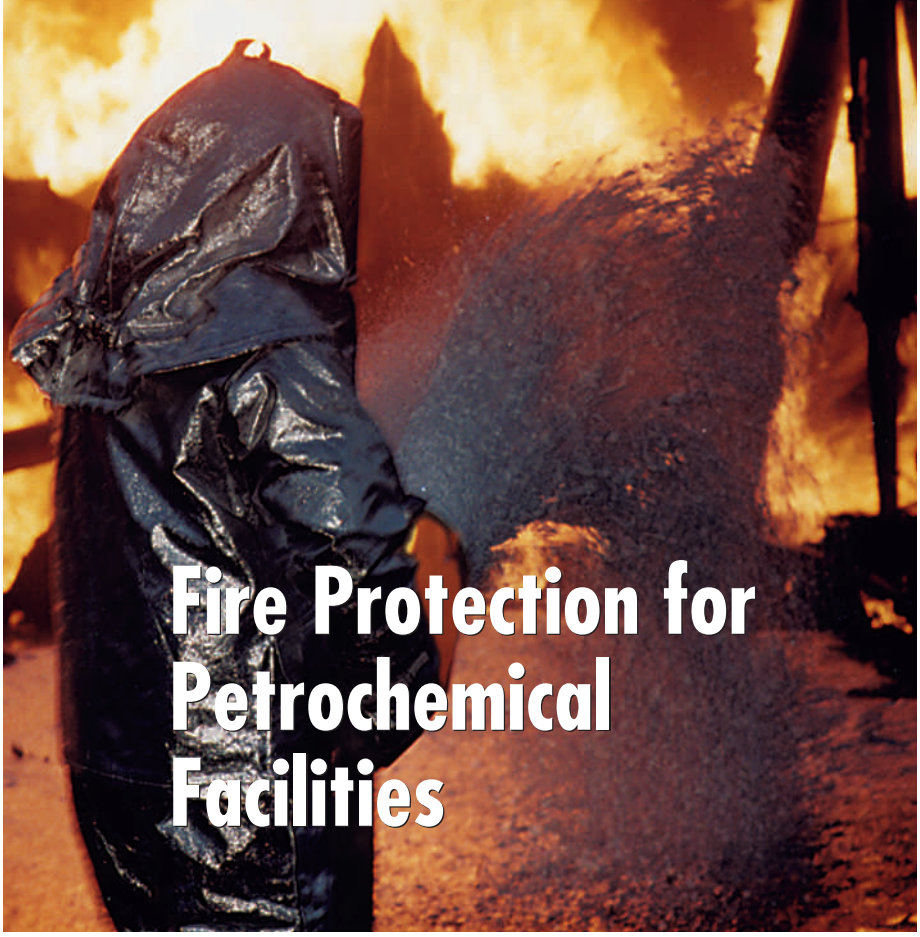
No one would dispute that the petrochemical industry has inherent risks of fire and explosion. The processing, storage and transportation of large volumes of flammable and combustible liquids is hazardous and those involved have a fiscal, moral and legal obligation to mitigate the potential threat of a major incident. In the UK, the Fire Safety Order of the Fire Services Act, which will come into effect early in 2005, places emphasis not only on preventing fires and reducing risks but also of mitigating the effects of a fire by prevention and containment. It also requires employers, owners or occupiers of buildings to ensure the safety of everyone who uses the premises and to protect people in proximity. The need for risk assessment is not new but the ethos of risk assessment should not be restricted to an occasional paperwork exercise. Indeed, it must be a dynamic process and a key component of workplace best practise especially when considering changes to processes and facilities. Changes will often alter risk profiles and this might negate the effectiveness of existing fire protection systems, which by design must be risk specific. Risk assessment, therefore, is an ongoing process and must be kept under constant review.

A HOLISTIC APPROACH TO FIRE PROTECTION

It must be acknowledged that risks can be minimised by following appropriate design guidelines. For example, properly constructed, correctly installed and well-maintained storage tanks are essential. As are the appropriate use of containment techniques and passive fire protection measures. It is not the intention of this article to discuss such measures merely to recognize the importance of a holistic approach to fire protection.

Everyday, Tyco Fire & Security encounters numerous applications within the Petrochemical industry and has become the market leader in design, manufacture, supply, install, maintain and commission of fire protection products – worldwide.

Design of fire protection systems requires expertise and experience in identifying the risks associated with hazardous materials and processes. Each application could warrant a different fire protection solution dependant upon the type of liquid involved and the systems designer must



Fire Protection for Petrochemical Facilities

Pic courtesy TSP

consider the flash point, boiling point and determine if the liquid is a hydrocarbon or a polar solvent (water-soluble) fuel. This information enables the designer to classify the liquid, which is the first part of the design process and this establishes the type of foam concentrate to be used, the application rate and the discharge

Pic courtesy TSP

time. To assist the designer, the National Fire Protection Association has developed a taxonomy for flammable and combustible liquids, which assists designers in developing appropriate fire protection tactics. For example, volatile liquids have a high vapour pressure and are easy to ignite. Products with a high vapour pressure and low flash point are more difficult to extinguish than products with a low vapour pressure and high flash point.

TYPES OF FIRE FIGHTING FOAM AGENTS

In recent years there have been many advancements in the field of foam concentrates. Suppliers have been vociferous in promoting their own type of generic product depending upon the manufacturing capability.

Foam is, simply stated, a stable mass of small, air-filled bubbles with a lower density than oil, petroleum, or water. It comprises foam concentrate, water and

Generic Type	Properties
Protein foam	● Stable mechanical foam ● Good expansion properties ● Excellent heat & burnback resistance ● High fluidity ● Low fuel tolerance
Fluoroprotein foam	● Inherent stability of protein base ● Faster flame knockdown ● Fuel tolerance ● Greater fluidity ● Hydrocarbon vapour suppression
Aqueous Film Forming Foam (AFFF)	● High quality foam ● Low or medium expansion ● Compatible with wide range of equipment ● Good shelf life ● Concentrated agents available for 1% induction
Film Forming Fluoroprotein Foam	● High stability foam ● Rapid knockdown
Alcohol Resistant Concentrates	● Synthetic or fluoroprotein ● Highly versatile ● Fast knockdown ● Good burnback resistance ● Fuel tolerant – used on hydrocarbon and polar solvents ● Excellent prolonged vapour mitigating properties

air. Because of the products low density, it readily floats on a fuel surface to extinguish a flammable liquid fire by separating the fuel from oxygen – it effectively smothers the fire. Its high water content provides effective cooling. A well formulated foam applied correctly will exhibit a range of properties including stability, cohesion, rapid fire knockdown, heat resistance and vapour suppression that will ensure that a fire is extinguished efficiently and securely to prevent reignition.

The fire protection industry produces a wide range of foam concentrates. A brief summary of the varying types appears on page 20.

Good quality of the apposite foam concentrate and an appropriate delivery mechanism is essential to provide effective fire protection at petrochemical facilities.

APPLICATIONS IN THE PETROCHEMICAL INDUSTRY

The petrochemical industry uses a variety of storage tanks for its products, each with a marginally different risk profile:

- **Cone Roof Tanks (Fixed Roof Tanks)**
- **Open Top Floating Roof Tanks**
- **Covered Floating Roof Tanks**
- **Horizontal Tanks**

Usually, tanks will be afforded primary protection by means of a fixed fire protection systems with secondary protection achieved through the use of monitors. Foam generators used in fixed systems have proved very successful in many installations and can provide a cost effective and reliable solution to fire protection problems. However, any damage to the tank structure could limit the foam generators efficacy and this together with maintenance issues have lead to the widespread use of subsurface injection systems assuming sufficient water pressure is available to use them. Subsurface injection of foam into a storage tank is, as the name infers, where the foam is injected into the bottom of a tank and floats to the surface to spread and extinguish a fire. However, this method is not suitable for use with polar solvents even where alcohol resistant concentrates are used because the foam is destroyed by the fuel. Care must be exercised so that it is not used on potential gasoline blends containing alcohol or other polar solvent additives as oxygenates. Further, sub-surface injection cannot be used on cone roof tanks with internal floaters per NFPA 11. To overcome this problem, semi-subsurface injection provides the benefits of subsurface injection for all types of fuels. The use of a flexible hose, which floats to the surface upon actuation, delivers the foam to the surface.

Fixed Monitors are a cost effective method of protecting relatively small

Pic courtesy TSP

Pic courtesy TSP

storage tanks and associated spill/ground fires. Remote operation can be accomplished through electrical or hydraulic control systems ensuring that fire fighters are kept at a safe distance from the incident. Although monitors streams have successfully been used for extinguishing fires in larger diameter tank fires using high-flow devices and large diameter fire hose, monitors should not be considered as primary protection for larger cone roof tanks with diameters in excess 18m, in accordance with NFPA 11.

Fixed systems can also be used for floating roof tanks and foam pourers are used to protect the rim seal area with the foam being contained by a dam. Good foam fluidity is essential to ensure that rapid coverage is achieved. Some oil companies have adopted a belt and braces approach and installed foam pourers and subsurface systems on covered floating roof tanks.

Horizontal tanks have been known to rupture following an explosion and it is necessary to ensure that the bund area is adequately protected. Fixed low or medium expansion generators can be used to create an effective foam blanket even on larger bund areas in major tank farms. Any residual fuel in the tank can be protected using a monitor. In reality, monitors can be used to protect the bund area but this results in much higher foam consumption. At least two monitors are recommended to protect larger bunds to ensure full coverage and/or access to devices under varied wind conditions.

Truck loading racks require special attention as a fire in this situation can escalate and threaten life safety. Foam can provide a quick knockdown with the added advantage of vapour suppression and containment to prevent reignition prior to the cleaning up process. Foam is delivered through a combination of an overhead foam/water deluge sprinklers supplemented by low-level ground sweep nozzles. Additional protection is provided against radiant heat and structural cooling is beneficial to prevent further damage. Monitors can provide cost effective protection but coverage remains an issue and the designer must be certain that his strategy will deliver the fire protection objectives.

CONCLUSIONS

Large storage tank fires are notorious and challenge all but the most professional and experienced fire fighting specialists. However, risks can be minimised through the careful design of fire protection systems following a detailed risk assessment. Technology combined with the common sense guidelines provided by NFPA 11 should be applied to mitigate the effects of fire and protect life and property.

BW TECHNOLOGIES LTD.

How customer requirements have shaped the state-of-the-art GasAlertMicro confined space gas detector

BW Technologies Ltd. is one of the world's largest makers of gas-detection equipment. Headquartered in Calgary, Canada, the company's products range from disposable, zero-maintenance personal H2S detectors, to permanently installed gas detection systems to the GasAlertMicro, the world's n confined space gas dete over 50,000 GasAlertMicros service, the instrument has redefine customer expect dependability, ease-of-use, and advanced features for co instruments.

Confined space gas detecto not been shy when it comes t their wishes. The state-of-the-art GasAlertMicro is a direct reflection of these customer requirements. The GasAlertMicro offers cutting-edge features and capabilities at a fraction c the cost of previous generat of instruments. In many ca $695.00 USD cost of a bran channel GasAlertMicro is le cost of replacing the sensors pack in an existing instrun only two or three years previously.

Simultaneously displaying oxygen, hydrogen sulfide, carbon monoxide and percent LEL combustibles present, the GasAlertMicro is ideally suited to a wide range of applications, including hazmat response, confined space entry, Homeland Security, search and rescue, and post-inspection fire safety.

The GasAlertMicro's features include high-output audible/visual/vibrator alarms; low, high, TWA and STEL alarm settings; a large, alphanumeric LCD with built-in backlight; two LEL measuring ranges (0-100% LEL and 0-5% by volume methane); a built-in concussion-proof boot; and optional data-logging capabilities. Datalogging GasAlertMicro detectors store monitoring data on a multi-media flash card (MMC) capable of retaining up to a full year of day-in day-out monitoring data.

Field-selectable user options allow the GasAlertMicro to be customized for virtually any monitoring application.

Calibration due-dates and alarm settings can be configured to meet specific industry requirements, and the Pass Code protection function ensures tamper-proof operation by preventing unauthorized users from accessing programming or calibration options.

The GasAlertMicro's flexible power options (two AA alkaline or rechargeable NiMH batteries) reduce downtime and provide up to 20-hours of continuous use. GasAlertMicro battery packs are completely interchangeable. Convert from alkaline batteries to a sealed nickel metal hydride (NiMH) battery pack simply by removing and replacing the battery pack currently installed. The available slip-in charger cradle and vehicle mounted chargers ensure that recharging instruments is easy and convenient. At just 211 grams (7.4 oz.), GasAlertMicro is truly more for less.

The GasAlertMicro is only one part of the BW approach to simplifying and reducing the costs of gas detection instrument ownership. Regulatory agencies and national performance standards are putting increasing emphasis on periodic testing, calibration, and documentation to ensure gas detection instruments are properly maintained. The BW MicroDock Test and Calibration System automatically tests and documents proper performance. Simply slip the GasAlertMicro into the MicroDock, and push the "Test" button. The MicroDock administers test gas to the instrument, verifies the proper performance of the sensors and alarms, updates this information to the instrument's on-board memory, and stores the results in a separate, downloadable archive on an MMC card in the MicroDock Base Station.

Other available options for the GasAlertMicro include the Sampler motorized sample-drawing pump for pick-hole and remote monitoring applications, additional holsters, protective boots, and chest harnesses. The instrument is also available in the special GasAlertMicro Stealth configuration for Homeland Security, police and anti-terrorist applications. Stealth version detectors are equipped with special silent alarms and infrared LED's visible only with special night vision goggles (NVGs).

Simply put, the GasAlertMicro is the world's best value in confined space gas detectors.

For more information please contact:

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T2A 7X9
Canada

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Fax: +1 403 273 3708
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IWMA
International Water Mist Association

IWMA Conference 2004

The conference will offer an opportunity for those responsible for selecting fire protection in government, industrial and commercial facilities to be updated on the current state of water mist technology for fire suppression systems.

The conference will be held from 6–8 October, 2004, in Rome, Italy. The conference hotel is going to be the Grand Hotel Palatino which is located in the city center of Rome. The world famous Coliseum for example is within walking distance.

Detailed information such as hotel address, registration form, call for papers and the like can be viewed on our home page www.iwma.net.

Potential authors are invited to submit interesting abstracts for this event. In addition to the regular sessions on research & testing and regulations, the focus of this conference will be on applications and actual solutions where water mist technology has been proven.

Member Meeting 2004

As being a tradition in the past, the member meeting 2004 will be held again in conjunction with the IWMA conference in order to save travel costs for all parties.

A separate invitation together with the agenda is going to be sent to all members a few weeks before the meeting. The meeting date will be the 8th of October, 2004.

European Standard for Water Mist Systems

The CEN working group on water mist systems has finished the draft of the guideline for water mist systems. This draft was submitted to the chairman, Mr. Everard Briers, of WG 5 (Working Group 5) of CEN 191 for further consideration. IWMA was informed by Mr. Briers that now the EU member countries will get the opportunity to make comments on the current draft. These countries will have approximately time until December 2004 to submit their comments. After that the water mist group will come together again and discuss the comments being received, and will work them in if appropriate. A final vote on the guideline for water mist systems can be expected for the end of 2005 if no unanticipated delays will occur. The IWMA will establish its own working group in order to assess the current draft standard. On the basis of the draft text, the working group will formulate its comments and turn in these comments to the CEN chairman through one of the EU member countries.

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FP 48 meeting in London

The Fire Protection Sub-Committee of the International Maritime Organization has held its 48th session from Jan 12–16, 2004, in London.

The working group on performance testing and approval standards for fire safety systems, under the chairmanship of Mr. Randall Eberly, considered a number of tasks where water mist technology is involved. One major step forward is that it has been agreed to develop a test protocol for machinery spaces (MSC 668/728) larger than 3000m^2. Experts, all of them IWMA members, sat together in a small group in order to sketch a first outline of this new standard.

The established correspondence group will work further on this subject.

Furthermore, it was with respect to MSC 913 for example also agreed to allow besides the vertically downward

positioning of nozzles the installation of nozzles at an inclined angle.

A member of the IWMA board, Mr. Robert Wickham, has written a comprehensive report on the work being done and the work to be done. This report can be downloaded from our web page under news & acts.
www.iwma.net/files/acts.html

New SC Member

After Bert Yu of FM Global had replaced Richard Ferron last year, Petter Aune of SINTEF in Norway has been appointed by the board. Petter can look back on extensive scientific work concerning water mist technology. The IWMA is pleased to have him onboard.

Scientific Council works on A.800 test plan

During the IMO meeting week at the beginning of last year, the Sub-Committee had revealed controversial standpoints on the interpretation of a particular paragraph which is 3.22 of resolution A.800(19) on revised guidelines for approval of sprinkler systems equivalent to that referred to in SOLAS. This guideline was written for the installation of water mist systems in accommodation areas on board ships. This special paragraph requires pumps and alternative supply components be sized so as to be capable of maintaining the required flow to the hydraulically most demanding area of not less than 280m^2.

The term "required flow" led basically to two different interpretations. One that the calculation of the required flow rate should be based on the maximum operating pressure during fire-testing.

The other favoured a performance-based approach with declining pressure during fire-testing.

FP 47 has shown that this subject matter, assigned by the Sub-Committee to the working group, could not be solved without comparative fire testing data. Now The IWMA offered at FP 48 to set up a research program to produce this necessary fire testing data.

Sumutuli sprinkler – Marioff Oy

That technical data, describing the performance of water mist systems at maximum operating pressure as well as declining system pressure during fire-testing with reference to A.800(19) testing conditions, would certainly help to resolve the controversy.

The IWMA Scientific Council begun in April, 2004, to develop a detailed test program how to carry out an investigation and assessment of the performance of water mist systems at maximum system pressure on the one hand and declining system pressure on the other hand.

It is therefore the intention of the IWMA Scientific Council to conduct a test series by involving manufacturers, test laboratories and approval bodies, to test water mist systems of different manufacturers under test conditions required by A 800(19). Hence, the same tests will be first carried out at maximum operating pressure and at declining pressure afterwards.

It is the objective to obtain valid technical data about the system performance under both pressure conditions.

It is planned to finish this test series before the dead line for IMO submissions in October so that the results can be presented at the next IMO meeting in 2005.

Seminar in Germany

The next IWMA seminar will be held in Germany on 21/22 October, 2004. Approximately 100 people from Germany, Austria and Switzerland will meet at IWMA headquarters to discuss this subject matter for two days. Further seminars are planned for Spain, Italy, France and Great Britain. Please check our web page regularly for dates and locations.

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CONTROL LOGIC Spark detector

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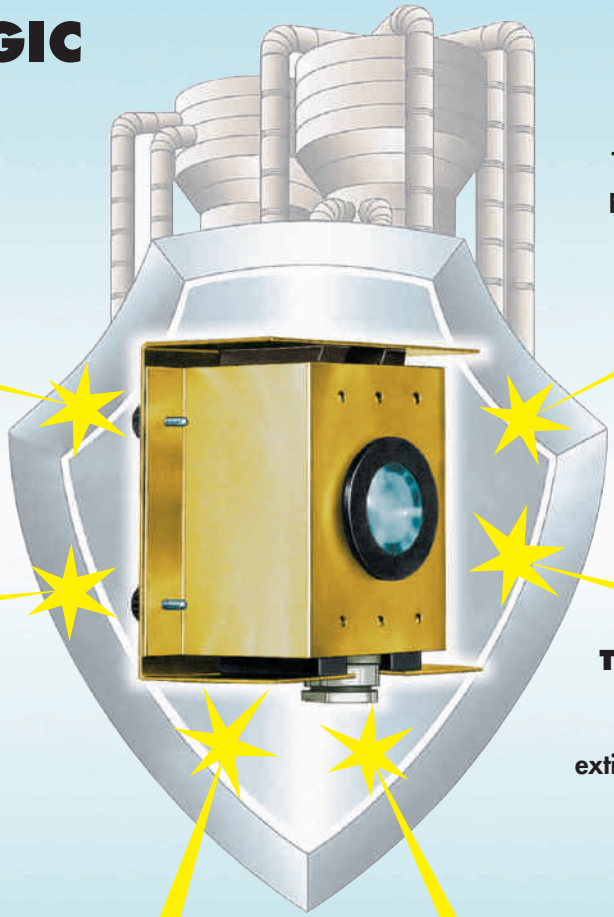

Sparks fly at high speed.

They travel at a hundred kilometres per hour along the ducts of the dust collection system and reach the silo in less than three seconds

The CONTROL LOGIC SPARK DETECTOR is faster than the sparks themselves. It detects them with its highly sensitive infrared sensor, intercepts and extinguishes them in a flash. It needs no periodic inspection.

The CONTROL LOGIC system is designed for "total supervision". It verifies that sparks have been extinguished, gives prompt warning of any malfunction and, if needed, cuts off the duct and stops the fan.

ISO 9001

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CONTROL LOGIC s.r.l.

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IR FLAME DETECTOR RIV-601/FA EXPLOSIONPROOF ENCLOSURE

For industrial applications indoors or outdoors where is a risk of explosion and where the explosionproof protection is required.
One detector can monitor a vast area and responds immediately to the fire, yet of small size.

Also for RS485 two-wire serial line

IR FLAME DETECTOR RIV-601/F WATERTIGHT IP 65 ENCLOSURE

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CONTROL LOGIC s.r.l.

DETECTION SYSTEMS SHOWCASE

Within this article we are showcasing Gas, Heat & Smoke Detection equipment. We have compiled information from the world's leading manufacturers of detection equipment. Please read the showcase and keep it to refer back to when needed. This guide will also appear on our website www.ifpmag.com

GAS DETECTION

THE NEW GASALERT EXTREME SINGLE GAS MONITOR FROM BW TECHNOLOGIES

BW Technologies has set a new industry benchmark for a rugged, weatherproof single gas monitor in the new GasAlert Extreme. The detector provides protection from H_2S, SO_2, Cl_2, CO, HCN, NO_2, O_2, NH_3 or PH_3. Ultra-compact and durable, the GasAlert Extreme with an IP66/67 rating offers the most advanced features of any single gas detector on the market today.

GasAlert Extreme features: high-output audible/visual/vibrator alarms; low, high, TWA and STEL alarm settings; a large, alphanumeric LCD with real-time display; auto backlight: "run silent mode" and a built-in concussion-proof boot.

Field-selectable user options enable GasAlert Extreme to be customized to virtually any environment. Calibration due-dates and alarm settings can be configured to meet specific industry requirements. The pass code protect function ensures tamper-proof operation by preventing unauthorized users from accessing calibration options.

Optional data logging, event logging and multiple language options provides more enhanced flexibility. BW Technologies' MicroDock calibration and test station, currently available for GasAlertMicro multi-gas detectors, will soon be compatible with the GasAlert Extreme for automated calibration, bump testing and record storage.

The GasAlert Extreme delivers cutting-edge protection and is ideally suited to a wide range of applications and environments including hazardous material response, marine and shipping, search and rescue, and post-inspection fire safety. At just 87 grams, the GasAlert Extreme is truly is more for less.

For more information please contact
BW Technologies
Tel: 1-403-248-9226
email info@bwtnet.com
www.gasmonitors.com

ULTRASONIC GAS LEAK DETECTION AT THE SPEED OF SOUND!

Within the petrochemical industry hydrocarbon gas leaks have been extensively in focus due to the potential catastrophic nature of gas leaks.

Fixed Ultrasonic Gas Leak Detection is now accepted by major oil and gas producers as one of the most effective ways to instantly detect hydrocarbon gas leaks. And ultrasonic technology is now a widely used alternative to traditional fixed gas detection systems (point detectors and open path detectors) in plant environment. The reason for that may be: According to the latest update on the HSE website traditional gas detection systems only detect 65% of all flammable gas releases in the UK offshore industry.

Innova Gassonic's Ultrasonic Gas Leak Detector MM0100 detects small (0.1 kg/sec) or large gas leaks at the speed of sound, in distances of 5-10 meters from the leak, regardless of changing wind directions or fast dilution of the gas cloud. Conditions that may cause traditional technologies to miss out on essential gas leaks.

To ensure maximum reliability and optimal performance by the ultrasonic gas leak detection system after installation, Innova Gassonic also offers onsite pre-installation mapping as well as onsite commissioning of the ultrasonic gas leak detection system to verify the performance of the system by using REAL SIMULATED GAS LEAKS.

Innova Gassonic has installed more than 1500 Ultrasonic Gas Leak Detectors for fast detection of hydrocarbon gas leaks both offshore and onshore. Worldwide installations include most major oil and gas producers in locations such as North Sea as well as major installations in Holland, the USA, Africa and the Middle East.

For a detailed reference list of existing users, please visit our website: www.gassonic.com or contact us directly at: mail@gassonic.dk

RAE SYSTEMS

The MultiRAE Plus combines a PID (Photoionization Detector) with the standard four gases of a confined space monitor (O_2, LEL, and two toxic gas sensors) in one compact monitor with sampling pump. Like the Leatherman™ tool, the MultiRAE Plus gets the job done in more circumstances than any other gas detector. With more than 10,000 units in the field today, its versatility makes it the gas meter of choice for some of the highest profile HazMat/WMD teams in the United States. The MultiRAE Plus is quickly and easily changed from a sophisticated technician instrument to a simple text-only monitor. The same monitor can be used as a personal monitor, a hand-held sniffer, or as a continuous operational area monitor.

The MultiRAE Plus detector can be made wireless with the use of RAELink. This allows real-time monitoring information from the detector to be integrated into an existing AreaRAE system. A wireless, RF (radio frequency) modem

allows detectors equipped with Firmware version 1.20 or higher to communicate and transmit readings and other information on a real-time basis with a remotely located AreaRAE base controller up to two miles away.

For more information please contact
RAE Systems
Tel: +1 877 723 2878
www.raesystems.com

ZELLWEGER ANALYTICS

Zellweger Analytics has announced a major upgrade to its MDA Scientific Vertex™ system – the leading multi-point toxic gas monitoring system for semiconductor fabrication. Part of the company's continuous product improvement programme, and based on direct feedback from customers, the upgrades make Vertex™ even more reliable, more secure and easier to use.

Vertex™ provides continuous monitoring of highly toxic gases such as the mineral acids and hydrides gasses used in semiconductor fabrication manufacture. It consists of a network of up to 72 fixed point Chemcassette® colorimetric sensors and a powerful but compact computer-based touch-screen control unit. The system provides high sensitivity, virtually cross-interference-free detection and clear physical proof of an event. Improvements in the new version include a twin-drive high-speed control computer, upgrades to the air flow sampling system and a new design of the innovative radio frequency identification (RFID) tags for fool-proof identification of Chemcassette® tapes.

The new Vertex™ double hard-drive computer system provides a complete mirror of the interactive operating system and data-logging capability for up to 72 separate zones, for complete redundancy. In the event of a drive failure, the system switches seamlessly to the back-up drive, with no loss of data or operating settings. For maintenance purposes, the drives are 'hot-swappable', ensuring continuous system availability, protected by key access. Microprocessor speed has been increased from 700MHz to 2.6GHz in the new version.

New diagnostics and hardware have been incorporated for monitoring redundant system power supplies, ensuring continuous availability of the installed back-up. New diagnostics have also been added to the pneumatic system for the identification of any problems in the site exhaust lines.

Gas detection performance has been enhanced with the addition of a system vacuum valve for more stable airflow and built-in pump monitoring for reduced maintenance. Pyrolyzers – used to detect complex species such as nitrogen trifluoride (NF_3) – have a more efficient heating element for faster warm-up times and an improved system power factor.

Zellweger Analytics' unique RFID Chemcassette® tags have been further developed and simplified with a new self-alignment system for even better reliability. This fool-proof method ensures maximum safety and confidence in the availability of critical monitoring applications.

The preferred gas detection system for the semiconductor industry, Vertex™ has an installed base of more than 300 systems world-wide. Existing users can access all upgrades through an attractive service upgrade package.

For more information please contact
Zellweger Analytics
Telephone: +44 1202 675900
Email: Tracy.Dawe@Zelana.co.uk

HEAT DETECTION

LINEAR HEAT DETECTOR WITH ATEX CERTIFICATE

Since 1 July 2003 all products in Europe to be used in areas subject to explosion hazards must be certified in conformity with European standard ATEX 100a. The manufacturer Securiton has now received the EC Conformity Declaration for its linear heat detector SecuriSens ADW 511 Ex-II ATEX. The device detects hazardous fire criteria rapidly and reliably based on the physical principle of pressure changes of gases at constant volume when temperature changes occur. The evaluating processor unit continuously checks the ambient temperature via copper sensor tubing. If the measured pressure increase exceeds the programmed value, an alarm is triggered.

This tried and proven alarming principle is virtually immune to electrical, thermal and mechanical disturbances. At regular intervals a precisely defined overpressure is created in the sensor tubing to detect faults. In the event of a detected leak or crushing, the detector signals a "Fault".

The heat detector can be used in Ex zones 2 (gas) and 22 (dust).

Fully electronic measuring cells and microprocessor-controlled evaluation allow response behaviour to be adjusted precisely to the specific requirements of the deployment location. The measured values can be graphically displayed and recorded using PC software. The evaluating processor unit can be installed directly in the Ex zone.

The SecuriSens ADW 511 Ex-II ATEX is currently the only heat detector that fulfils Class A1 requirements in compliance with EN 54-5 and can also be used with high ambient temperatures. It is also VdS certified.

For more information please contact
Securiton AG
Tel : +41 31910 1122
www.securiton.ch

SMOKE DETECTION

SMOKE PROTECTION IN HAZARDOUS AREAS

FIRERAY
Fire Fighting Enterprises

In hazardous areas such as oil rigs, refineries and petrochemical plants, protection against fire is routinely provided by optical flame detectors. However, while well able to respond to "straight" fuel fires where a clean flame is quickly seen, these devices react more slowly to smouldering, smoking fires where other materials are involved. To combat this problem, wide-area, explosion-proof smoke detectors can be installed as a complementary measure.

Beam detectors are already widely used in open-plan areas like churches and stadiums. The principle is simple: when an infrared beam is sent from a transmitter mounted high on a wall to a receiver opposite, the strength of the signal received is reduced by the presence of smoke in the space between. To adapt this system for hazardous areas, ATEX-certified housings are used to enclose both parts of the detector.

Once correct alignment has been achieved, a small remote controller housed in a safe area can then be used to adjust alarm levels and test functionality. Crucially, if the detector heads themselves do not contain control electronics, there

MultiRAE

5-gas Detector

- Choose VOC, O_2, combustible gas (LEL), CO, H_2S, SO_2, NO, NO_2, Cl, HCN, NH_3, PH_3
- Instantaneous feedback and detection for HazMat and WMD responders worldwide
- Broadband detection for Toxic Industrial Chemicals (TICs) and front-line detection of Chemical Warfare Agents (CWAs)

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5-gas Wireless Detector with Optional GPS

- Rugged, wireless situational awareness up to two miles away
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Hazardous Environment Detection

www.raesystems.com

RAE SYSTEMS

RAE Systems
1339 Moffett Park Drive
Sunnyvale, California 94089 USA
Email: RaeSales@raesystems.com
Sales Support: 877.723.2878

should be no need to return to them other than for occasional cleaning and alignment checking.

A beam detector installation can cover a surprisingly wide area. With the two components installed 100 m apart, a single set can cover up to 1500 m^2. In comparison, around 15 standard "point" smoke detectors would be needed to cover the same area, greatly increasing both hardware and cabling costs.

Good beam detectors come with inbuilt drift compensation. This software feature automatically compensates for any gradual decrease in signal strength caused by the accumulation of dust or the slight movement of the building, so preventing an unwanted alarm. An alignment aid is another essential, the simplest and most intuitive being a pair of flashing LEDs directing the installing engineer to the optimum alignment of transmitter and receiver.

For more information please contact
Fire Fighting Enterprises Limited
Tel: +44 (0) 1438 317216,
Email: jknappert@ffeuk.com
www.ffeuk.com

KIDDE FIRE PROTECTION HART MINI

Kidde Fire Protection's *Hart Mini* High Sensitivity Smoke Detector (HSSD) provides cost effective, very early warning smoke detection for small areas (up to 800 sq metres). Using a laser particle counter, Hart Mini detects small amounts of smoke from overheating or smouldering equipment before the smoke is visible. This very early warning allows time for the event to be investigated, and for critical decisions to be made, which may include shutting down protected equipment, preventing the progression of the fire.

Hart Mini can be configured to meet specific requirements when responding to an emergency situation, depending on the amount of smoke detected. Pre-Alarm initiates an immediate investigation of the problem, whilst when greater amounts of smoke are detected, an Alarm initiates automatic shut down. The detector sensitivity is programmable over a wide range, so Pre-Alarm and Alarm levels can be set to match the specific characteristics of individual applications.

Hart Mini is an aspirating smoke detector (ASD). Unlike a passive conventional smoke detector, Hart Mini incorporates a fan to continuously draw air from the protected area, through a pipe network and into the laser particle counter for analysis. The presence and concentration of smoke is determined by counting the number of discrete particles in a given time period. Hart Mini's particle size discrimination technology allows only particles in the range of 0.1 to 10 microns to be counted as products of combustion. Particles outside this range are ignored and do not contribute to the smoke level calculation. Because Hart Mini's particle size discrimination is performed electronically, no filters are required.

For more information please contact
Kidde Fire Protection
Tel: 01844 214545
www.kfp.co.uk

SYSTEM SENSOR EUROPE

System Sensor Europe's new Vision family of conventional detectors has the unique feature of being testable from ground level using its laser-based remote test unit. During commissioning or routine maintenance, the engineer can remotely set the detector into alarm from the ground, doing away with the need for cumbersome long poles or stepladders, thereby reducing the on-site time required.

Vision is designed for smaller, less complex installations such as offices, retail units, bars, restaurants, schools, nursing homes, small hotels and other similar commercial premises. The range is comprehensive, with a multi-criteria photo-thermal detector, a photoelectric detector, a rate of rise thermal detector and 58°C and 78°C fixed temperature detectors; standard low profile and deep surface mount bases complete the family. The photoelectric and photo-thermal detectors feature automatic drift compensation, a feature, previously found only in addressable sensors, that offsets changes in sensitivity that would otherwise arise from the build up of dust during use. A highly integrated design, on-board digital signal processing and a new optical chamber design results in an exceptionally stable and sensitive smoke detector. The multi-criteria unit is an environmentally safe replacement for ionisation detectors, responding rapidly to fast flaming fires without the problems of transportation, storage and end of life disposal of radioactive material. All models draw around 50µA quiescent current, minimising the load on the control panel.

Vision is third party approved to EN54 part5/part7 (2000) and it is compatible with the great majority of conventional control panels on the market, enabling it to be specified in both new installations and when existing systems are being extended.

For more information please contact
Glen Collins
System Sensor Europe
Tel: + 44 (0)1403 891920
www.systemsensoreurope.com

VESDA LASERFOCUS

VESDA LaserFOCUS is the NEW offering from **Vision Fire & Security** – extending the product range by offering VESDA detection performance for smaller critical areas. The VESDA LaserFOCUS is designed to be a good solution for the protection of smaller spaces that if affected by fire would have a significant business impact, for example; tier 3 telecommunication facilities, distribution and control hubs in utility and transport industries, electrical sub-stations and railway carriages. Benefits include:

- Earliest possible warning of a potential fire, ensuring the most reliable protection of assets and property.
- The world's most reliable early warning smoke detection system, avoiding the occurrence of nuisance alarms
- Simplified or advanced set-up features
- Seamless interface to ALL existing fire protection and alarm systems
- Worldwide Approvals
- Ease of installation, commissioning, and maintenance
- Expansion capability to provide additional relays, VESDAnet connectivity, remote displays and a variety of communication formats

For more information please contact
Vision Fire & Security
Tel: +44 (0) 1442 242 330
www.vesda.com

Fire and smoke aren't the only deadly threats in this photo.

Toxic gases, oxygen deficiency and unignited combustible vapors are invisible, but very deadly hazards. You can't see them… but the ***GasAlertMicro*** can. And with the ***MicroDock***—Automatic Test and Calibration Station—using it is easier and simpler than ever.

GasAlertMicro
Multi-gas Detector

- simultaneous display of H_2S, CO, O_2 and LEL
- compact - only 211 g (7.4 oz)
- triple alarms (audible, visual and vibrating)
- integral concussion-proof boot
- ***GA MicroBatt*** slip-in cradle charger available

starting at
$695USD

MicroDock
Automatic Test and Calibration Station

- fully portable
- fully automatic calibration
- stores and updates calibration records
- expandable to 10 modules
- no computer required

starting at
$1,995USD

For more information email: **info@bwtnet.com** or call:

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China	**+011-852-2974-1783**	**Canada**	**1-800-663-4164**	**USA**	**1-888-749-8878**
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Floating roof tank protection in extreme cold areas

By Jaap de Zwart, Saval BV

THE FIRE PROTECTION of floating roof storage tanks in the hydrocarbon processing industry located in extreme cold areas is of major concern.

New oil fields are being developed in Sachalin, Kazakhstan, Siberia, where weather conditions can be harsh.

Fixed foam systems are often used as a standard solution for the protection of the rim seal areas of these floating roof storage tanks and offer a high protection level due to the possibility of extended application times.

Low temperatures down to –50°C are common during the winter season and this requires a lot of attention with regard to the design and installation of firewater and foam systems. Even when the wet part of a firewater system is entirely freeze protected, freezing of water during filling of dry above ground piping can hardly be avoided.

Fire fighting under low temperature conditions is always a very difficult task.

It is well known that rim seal fires may start very small and can easily be extinguished in the beginning. Only after some time the seal material will burn away, the seal plates deform and the intensity of the fire increases.

So it is clear that the damage can be kept to a minimum if the existence of a fire is detected as early as possible and an automatic freeze proof extinguishment facility is available.

Gaseous extinguishing systems for floating roof tank protection have been used with great success for more than 40 years now. The reliability of a well designed system using corrosion resistant materials and materials that can withstand climatic conditions like UV radiation has proven to be very high.

The main advantage of a gaseous extinguishing agent is the fact that the cloud of the gas with a high specific

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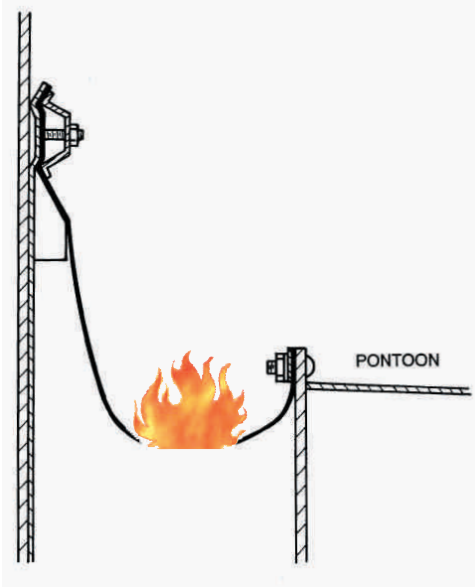


Hole in primary seal

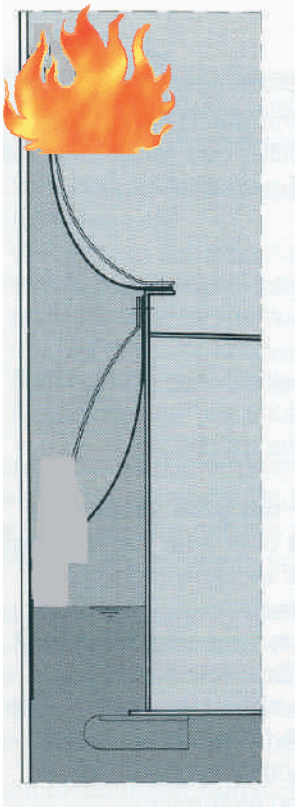
Floating roof tank protection in extreme cold areas

vapor density is immediately acting three dimensionally whilst foam needs time to fill an area between the tank wall and the foam dam.

Vapour from the stored product is collected in the vapour space above the liquid level between the floating roof and the tank shell.

Although modern seal constructions are well designed, especially with regard to vapour escape to atmosphere, an analysis of fire risks shall be based on a worst case situation. This means that mechanical damage or damage by wear never can be excluded. This damage can lead to a dangerous mixture of vapour and air in the space above the single primary seal or in the space above the secondary seal.

Shunts between the floating roof and the tank shell, provided for prevention of electric potential differences, can malfunction due to a layer of wax or dried residue from the stored product on the inside of the tank shell or due to mechanical failure. Electric potential difference between the floating roof and the tank shell caused by the energy of a lightning strike or by static charge of the tank during product transfer can lead to explosion. Such an explosion in turn will cause more damage to the seal construction and/or weather shields if present.



Damaged primary and secondary seal

Based on above mentioned causes of fire and the three main constructions of seals one can distinguish three main fire scenarios:

- primary seal damage
- secondary and primary seal damage
- shoe plate damage

Combustion processes can only be maintained in presence of the three basic ingredients: fuel, oxygen and heat. It is obvious that the location of flames will be in the area where the oxygen is available.

Experience on rim seal fires has learned that flames will be present above a primary seal, above the secondary seal in case of double seals and in the space between the upper seal and weather shields if present.

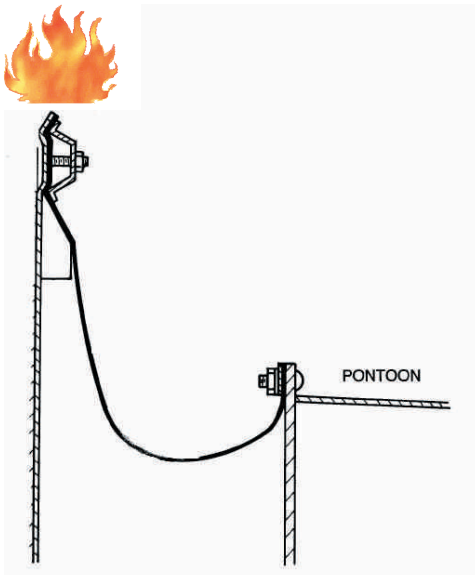
The space below a single seal and the space between a double seal do not contain enough oxygen in order to support the combustion of the fuel.

At the time of the development of this type of systems, Halon 1211 (BCF) was used as an extinguishing agent.

Many Halon alternatives have been evaluated since the Montreal protocol has dictated the ban of CFC's for fire protection like the Halon 1211 and Halon 1301. Halons were well known because of their very powerful fire fighting capabilities based on chemical inhibiting action on molecular level. Of all the alternatives mentioned in the National Fire Protection Association standard NFPA 2001, CF_3I has the best performance; even better than Halon 1211 on most of the common fuels.

From the environmental point of view CF_3I is also an excellent candidate with its zero ozone depletion potential, an almost zero greenhouse warming potential and an atmospheric lifetime of 1.25 *days*.

The excellent fire fighting capabilities, the very good environmental behaviour and the acceptance of CF_3I as one of the best alternative fire fighting agents for



Shoe gap

protection of engine nacelles of aircraft have been the key elements in the decision to promote this agent as the best alternative for the Halon 1211, applied in floating roof tank protection systems on more than 4000 tanks world-wide.

The toxicological profile of CF_3I has been studied and a comparison with Halon 1211 shows that the two fire fighting agents are very similar. Two situations can be considered with regard to exposure to CF_3I; the exposure caused by leakage during filling or draining of the floating roof tank protection system on the tank roof and the exposure during a discharge in a fire situation where in both cases the maximum spill of CF_3I is limited to a full contents of a storage container or a transport container being 20 kgs.

The fire protection system consists of a container, filled with CF_3I and a supply line, permanently connected to and pressurized by the container. This supply line is running along the rim seal and has discharge nozzles with built-in glass bulb detectors every two meters of circumference. The CF_3I is superpressurized in order to provide the proper expelling force also under low temperature conditions.

Of course the fire protection system itself shall be designed and constructed in order to withstand these extreme low temperatures.

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Room Size	Viking Freedom Residential VK-425		Tyco LFII Conc.		Reliable RFC43	
	Flow	Pressure	Flow	Pressure	Flow	Pressure
12′ x 12′	15 gpm	13.3 psi	13 gpm	9.6 psi	**12 gpm**	**7.8 psi**
14′ x 14′	16 gpm	15.2 psi	14 gpm	11.1 psi	**13 gpm**	**9.1 psi**
16′ x 16′	20 gpm	23.8 psi	16 gpm	14.5 psi	**13 gpm**	**9.1 psi**
18′ x 18′	-	-	20 gpm	22.7 psi	**18 gpm**	**17.5 psi**
20′ x 20′	-	-	24 gpm	32.7 psi	**21 gpm**	**23.9 psi**

Horizontal Residential Sprinkler

Room Size	Viking VK450		Tyco LFII HSW		Reliable F1RES44 HSW	
	Flow	Pressure	Flow	Pressure	Flow	Pressure
14′ x 14′	14 gpm	11.1 psi	14 gpm	11.1 psi	**14 gpm**	**10.2 psi**
16′ x 16′	18 gpm	18.4 psi	16 gpm	14.5 psi	**16 gpm**	**13.3 psi**
16′ x 18′	18 gpm	18.4 psi	19 gpm	20.5 psi	**18 gpm**	**16.8 psi**
18′ x 18′	-	-	-	-	**19 gpm**	**18.7 psi**
16′ x 20′	22 gpm	27.4 psi	23 gpm	30.0 psi	**23 gpm**	**27.4 psi**

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Deluge Spr

By Alan Brinson of the European Sprinkler Network

DELUGE SPRINKLER SYSTEMS are the type preferred by film-makers. These systems are designed to spray water from every sprinkler or pre-determined group of sprinklers at the same time. They look dramatic on camera but represent less than 10% of water-based fire suppression systems and an even smaller proportion of sprinkler systems. They are generally used to protect areas where there is a risk that fire could develop very rapidly or where there is a need to delay the release of water while other processes are shut down. An example of an application that requires a delay is a tunnel sprinkler system, where traffic must be stopped before the system begins to spray water. During the delay the fire will spread. Therefore as soon as it is safe to release water it is essential to cover a larger area, including surfaces beyond the fire, so as to prevent further fire spread.

Deluge sprinkler systems are operated by a detection system. This can be an electrical detection system, reacting to one of or a combination of products of combustion, smoke particles, heat or flame. Alternatively it can be an additional array of closed sprinklers, sometimes called pilot or detection sprinklers, connected by small diameter pipe. The pipe is filled with water or with air in zones at risk of frost. A sprinkler detection line has the advantage of simplicity, robustness and the resistance to false alarms of automatic sprinkler systems, while an electrical detection system can react faster to very rapid fire development or allow incorporation of a system release delay if other actions must be taken first.

The hydraulic design methodology for deluge sprinkler systems is the same as for automatic sprinkler systems. The aim is to cover a design area with water at a near uniform application rate (flow-rate per square metre expressed as mm/min). The same sprinkler heads are used but the bulb or other fusible element, together with the water seal, is removed. Instead of a wet alarm valve the system has a deluge valve, which is opened by the detection system and allows water to flow to all the open sprinklers.

There are many types of deluge valve on the market to fulfil specialist functions:

- Straight-through valves which release water to a vertical riser
- Angle valves to send water horizontally through a wall into a protected area
- Slow-opening valves which open gradually to prevent water hammer
- Quick-action valves where speed is essential, such as in munitions stores
- On-off valves for large sites for a remote test of valve function each week or to allow a system to be turned off to minimise the release of water or additives
- Bronze, stainless steel or titanium valves for corrosive environments
- Large diameter (10″) valves for large flow rates and areas
- Small diameter (1″-2″) valves for small risks such as escalators. These are also known as multiple-jet controls and operate when an integral glass bulb shatters at its set temperature.

Another important difference between wet pipe automatic sprinkler systems and deluge sprinkler systems is the need to use galvanised pipe to prevent internal corrosion in the air-filled pipe, which is exposed to atmospheric humidity.

The decision to opt for a deluge sprinkler system is one of judgement. The European sprinkler system design standard, EN 12845, does not cover deluge sprinkler systems except to state that High Hazard Process Group 4 hazards, an example being firework manufacture, are usually protected by deluge sprinkler systems. NFPA 13, the U.S. standard for the installation of sprinkler systems, gives a few very specific examples of where a deluge sprinkler system is required. These examples help to illustrate when a deluge sprinkler system is appropriate:

STAGES 8.14.15.2

"Where proscenium opening protection is required, a deluge system shall be provided with open sprinklers located at not more than 0.9m away from the stage side of the proscenium arch and spaced up to a maximum of 1.8m on center." The appendix to this section of the standard explains that a deluge sprinkler system may be allowed in combination with a non-combustible curtain instead of a fire resistant

inkler Systems

proscenium curtain. The deluge sprinkler system "shall be located on the auditorium side of the proscenium opening and shall be arranged so that the entire face of the curtain will be wetted. The system shall be activated by a combination of rate-of-rise and fixed-temperature detectors located on the ceiling of the stage."

CLASS A HYPERBARIC CHAMBERS 13.18.1.1

"In chambers that consist of more than one chamber compartment (lock), the design of the deluge system shall ensure adequate operation when the chamber compartments are at different depths (pressures)."

This section then goes into great detail about the system design, including the required application density, water distribution, water delivery time and water supplies.

CROSS-FLOW WATER COOLING TOWERS 13.21.1.1.2

Cooling towers often contain wooden packing which quickly dries out when the tower is out of service. It can then burn and fire spread is likely to be rapid. The standard gives extensive guidance on how to design systems to protect cooling towers. Aside from the risk of rapid fire development, deluge systems are preferred because they avoid the risk of freezing in water-filled pipes.

AIRCRAFT ENGINE TEST FACILITIES 13.26

Here the standard recommends a deluge sprinkler system, although an automatic sprinkler system can also be used in small test cells of less than 56m^2 where all the sprinklers would fuse at once and so effectively work as a deluge system. The water application density is 20.4mm/min for a minimum of 30 minutes.

CLASS 4 OXIDIZERS 13.27.1.6

"Sprinkler protection for Class 4 oxidizers shall be installed on a deluge sprinkler system to provide water density of 14.3mm/min over the entire storage area."

DETACHED STORAGE OF CLASS I ORGANIC PEROXIDE FORMULATIONS 13.28.1.4

"Sprinkler protection for Class I organic peroxide formulations in quantities exceeding 908kg in detached storage shall be of the deluge type.

CABLE TUNNELS 13.29.1.3

Here the designer can choose either an automatic sprinkler system to protect the most remote 30.5m and 232m^2 of tunnel, or a deluge system that divides the cable tunnel into zones and is capable of applying the design density throughout any two adjacent zones. Often the automatic sprinkler system will be a lower-cost option.

ATRIA

Some designers recommend deluge systems for atria, where the sprinklers may be so far from the floor that the designer cannot assume that heat will rise vertically to the sprinkler above the fire. A combination of electrical detection and a deluge system covering the entire atrium offers a more reliable means to control fire in such a large, high-ceilinged space.

SOLVENT EXTRACTION PROCESSES

Another hazard that is commonly protected by a deluge sprinkler system is solvent extraction process equipment or

structures. For this risk NFPA 13 recommends an application density of 10.2mm/min but this can be reduced to 6.5mm/min if a foam additive is added to the water.

Aside from deluge sprinkler systems there are deluge water spray systems. These are the same as deluge sprinkler systems except that they are fitted with directional nozzles instead of sprinklers. The nozzles are designed to spray water at an object or surface rather than sprinkle it over an area. Water spray systems are used for:

- Extinguishment of fire
- Control of burning
- Exposure protection
- Prevention of fire

Water spray nozzles achieve these goals by spraying water at objects and vertical surfaces. To do so they require a higher nozzle pressure than the minimum standard spray sprinkler pressure of 0.5bar. Medium velocity, MV, sprayers typically operate above 1.5bar and use a deflector to disperse the water stream into a conical discharge. Aside from the directional character of the discharge, the water droplets are finer than from sprinklers. This makes them better at absorbing radiant heat to prevent fire spread. MV sprayers are used in most water spray systems. High Velocity, HV, sprayers usually spin the water at over 2bar inside the nozzle so that it emerges as a solid cone jet. They are used where the nozzle cannot be close enough to the hazard for MV sprayers to protect it; where there is a risk that high wind could blow away MV spray; or where there is a need for a very narrow cone angle. They are also used to produce an emulsification effect on the surface of burning oil to prevent the release of further combustible vapours. For this application the minimum nozzle pressure is 3.5bar.

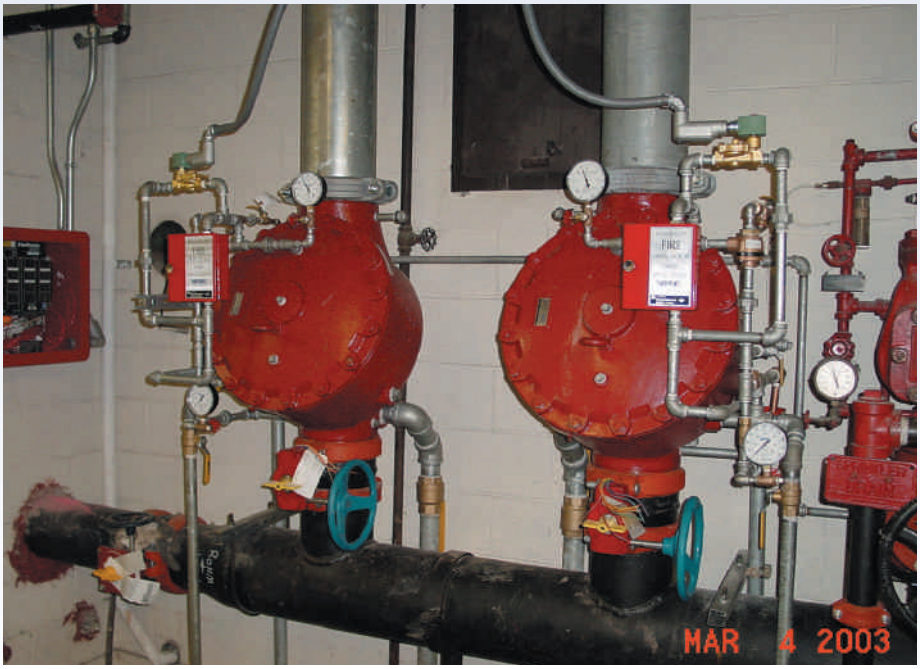
CEN has not yet completed the drafting of a European water spray system design standard so most designers turn to NFPA 15. It is not the intention of this article to cover water spray systems in any more detail.

Another type of deluge sprinkler system is the deluge foam sprinkler system. Foam concentrate such as aqueous film-forming foam, AFFF, is added to the sprinkler system water when the deluge valve is activated. The surfactants in AFFF concentrate reduce water surface tension so that it easily foams. The mechanical agitation as the solution passes through a sprinkler and strikes a deflector plate is then sufficient to form low expansion foam. AFFF also enables water to form a film on insoluble flammable liquids (Alcohol Resistant Concentrates, particularly the new hydrophobic types, allow the same effect on water-soluble flammable liquids). This film carries the insulating foam over the liquid surface, where it prevents the release of more combustible vapours and starves the fire of fuel. Foam also insulates the flammable liquid from external heat sources so that it does not reignite.

Since plain water is denser than most flammable liquids it sinks beneath the surface and is not efficient on these types of fire. With the addition of foam concentrate, water becomes much more effective so its application rate can often be greatly reduced, as for solvent extraction processes in NFPA 13.

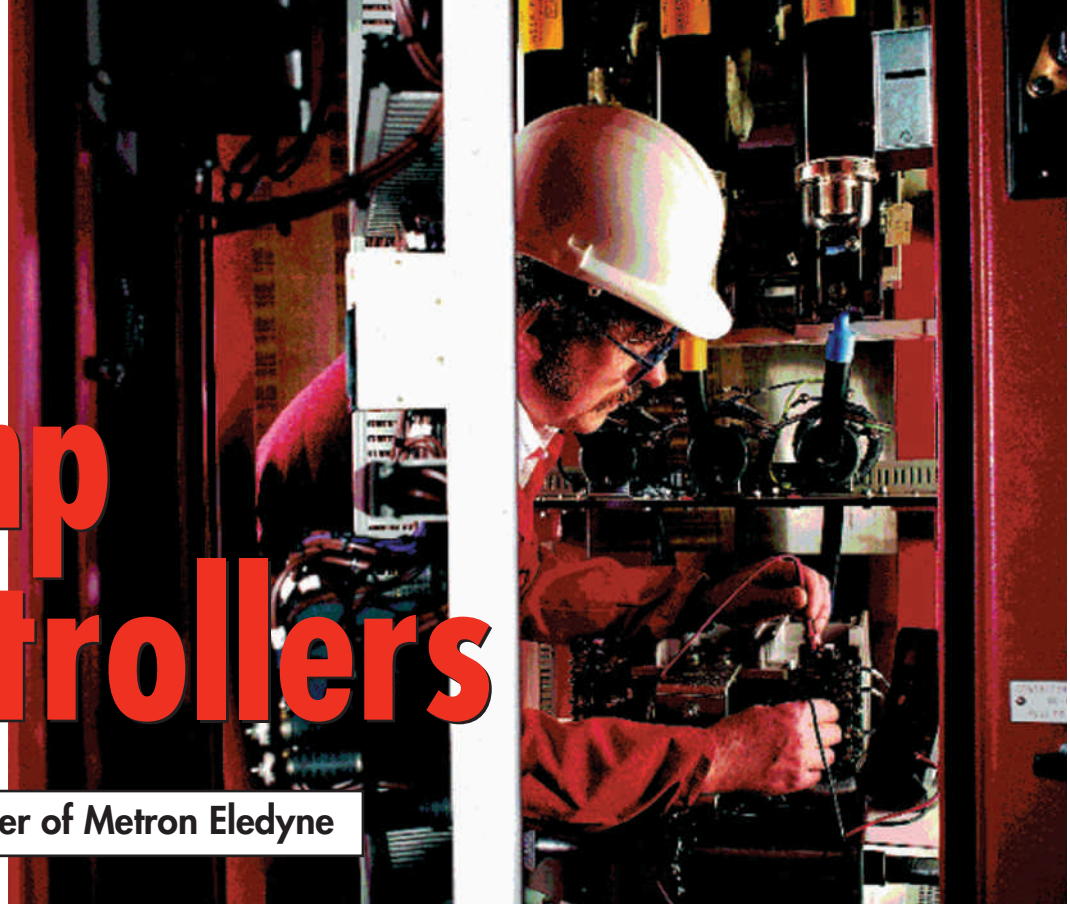
Although CEN has produced standards for foam concentrates it has not yet produced a design standard for foam sprinkler systems, so designers use NFPA 16. Some designers add foam to deluge sprinkler systems in process plant so that the solution with its low surface tension will spread better over greasy surfaces and run down them without channelling. Others use foam to allow better penetration of solid (Class A) materials.

A common application of deluge foam sprinkler systems is to protect aircraft hangars, in particular the aircraft they house which are worth more than the hangar. NFPA 409 is the internationally recognised design standard for aircraft hangar fixed fire protection systems.



This article has given an overview of deluge sprinkler systems and brief details of other deluge systems which are not, strictly speaking, sprinkler systems. While the various design standards mentioned in the article give some guidance on when to use each type of system, the selection is usually a matter of engineering judgement based upon a risk analysis and experience.

Fire Pump Controllers



By David Carter of Metron Eledyne

UNDER THE LATEST EDITION of the NFPA 20 fire pump standard, it is the fire pump manufacturer's sole responsibility to guarantee the operation of the fire pump skid set. Therefore the pump manufacturer typically assembles the skid and purchases the remainder of the components from specialised manufacturers. One of these key components being the fire pump controller. The pump is either powered by a diesel engine or an electric motor. Both types obviously require a different type of controller, and these will be examined in more detail in the following text.

DIESEL ENGINE DRIVEN FIRE PUMP CONTROLLERS

The fire pump standard NFPA20 specifies in detail the correct operation of the fire pump system and in particular the controller functions. On a diesel set, there are two engine start batteries fitted, both are either a 12v or 24v. It is the diesel controllers' function to ensure that these batteries are fully charged and ready to crank the engine in an emergency. NFPA20 specifies that the battery charger must be able to completely recharge these batteries from a fully discharged state within 24 hours. NFPA20 also calls upon an Under Writers Laboratory standard, UL1236 for further functions of the batter charger. In particular the following further functions are required of the battery charger:

- The charge rate should automatically be reduced to less than 500mA when the batteries are fully charged.
- The battery charger will provide a charger fault alarm.
- The battery charger should be able to limit the output current in the event of sudden voltage dips. (As caused by the engine cranking by emergency means)
- The battery charger should provide the necessary degree of protection against electric shock, fire and injury.
- The battery charger should be able to withstand a dielectric test equal to 2U+1000 volts, where U is 240v.
- The battery charger should operate, at the maximum output, with no accessible parts exceeding the following temperatures:

  parts to be grasped or held:
  metallic 25EC – non metallic 35EC

  parts that can be touched:
  metallic 35EC – non metallic 35
- The output transformer of the battery charger should be capable of sustaining a short circuit

The above features make the battery charger of a diesel engine fire pump controller very special, and hence a standard industrial unit cannot be used.

The controller must have facilities to manually crank the engine and to have an automatic start function via an electronic crank timer. The standard defines the crank timer operation as:

- 15 seconds crank from battery A
- 15 seconds dwell
- 15 seconds crank from Battery B
- 15 seconds dwell

This sequence is repeated three times after which a failed to start condition is realised. At all times, the battery voltage is monitored. Should the voltage fall below ½ the normal float level, then that battery becomes locked out from further cranking.

Once the engine is running, it is monitored for:

- Low oil pressure
- High water temperature
- Engine Overspeed

Only the engine overspeed alarm is allowed to shut the engine down. The NFPA 20 rules specify that low oil pressure and high water temperature must not shut the engine down in a fire condition. The engine is required to run to destruction.

The controller is usually monitored by a remote station, achieved by remote contacts within the controller. Such signals that are monitored include: engine running, engine failed to start and fault on engine or controller. There is also an audible alarm located on the controller that may be silenced in certain conditions.

NFPA 20 additionally specifies that the engine shall be started once a week automatically via a weekly start timer in a test mode.

ELECTRIC MOTOR DRIVEN FIRE PUMP CONTROLLERS

An electric motor fire pump controller is required to start the motor, by using a variety of starting methods under fire conditions. Typical starting arrangements are:

- Wye (star) delta (Using open or closed transition)
- Direct on line
- Reduced voltage starts (resistor, transformer or electronic soft starter methods)

The main power components in this type of controller are specified in detail in the NFPA20 standard:

Isolator switch
Sized >115% FLC (Full load current) of motor

Contactors
Either Direct on Line or Star Delta (horse power rated)

Circuit breaker
Sized to >115% FLC of motor.
Non-thermal over current sensing type
Instantaneous trip facility, must be set <20 times FLC
Tripping time between 8 and 12 seconds at 6 times FLC
Be able to hold 300% FLC indefinitely.

The standard defined indicator lamps are named 'power available' and 'phase reversal'; however, controller manufacturers offer other functions as options. Any alarm must not prevent the motor from starting.

There must also be an emergency start mechanism for starting the electric motor for when the control circuit has failed.

IN EUROPE

There is a current trend in Europe for clients to specify systems that comply to the 'intent' of NFPA 20, such a system is not approved or verified for operation by a recognised body, such as Factory Mutual or U.L. In this mode, the set is referred to as UNLISTED and is considered a lower cost option. There is also a relatively new fire pump standard that was released by CEA that is intended for the whole of Europe, but each of the individual countries appears to be reluctant to take it up at this time.

FUTURE TRENDS

Due to diesel engine developments, and also as a result of rapid developments in information technology, the whole field of fire pump control is likely to change dramatically over the next few years. Already we are seeing the change to electronically controlled diesel engines for industrial applications. This has come about due to the various World standards limiting emissions from diesel engines, but brings with it benefits in terms of higher levels of information from the engine systems. This when integrated with the advances in the controller systems will enable far more capability for remote monitoring and management of the fire pump system. International Companies with operating facilities spread throughout the world, will be able to monitor both the operating characteristics and service requirements of their fire protection equipment from anywhere via the internet, and receive fault notification by means of e-mail or text message to their service personnel. Engine and Controller manufacturers will be able to undertake remote fault analysis from their factories, and guide on site maintenance staff to the correct repair solution, without the need to send specialised service engineers jetting off to far flung corners of the world.

Technically these advances are currently possible, but at this time fully electronic diesel engines have not been accepted for fire pump operation because of electronic module reliability issues and because of cost, hence the mechanical governor system is currently preferred, but for how much longer?

Author: David Carter MEng (Open) BSc(Hons) CEng MIEE. Metron Eledyne, based in the UK, is a division of TWP, LLC which includes Metron INC of Denver, USA.

Fire pump packages develop to meet industry needs

Pic courtesy SPP Pumps

By Alex Playfair of SPP Pumps

AS WORLD MARKETS ADVANCE and fire protection systems evolve to satisfy the new needs, fire pump technology is developing to keep pace with the demands created by the changes. Revised regulations are also determining the duty demands and specification requirements of fire pump packages. Combined, this results in an ever-changing scope of package supply with new pump types required and packages developed to satisfy the needs of current and future applications.

FIRE PUMPS FOR WAREHOUSES

The EN12845 regulations will become the common European standard for automatic sprinkler installations. Their forthcoming implementation will change the standard flow demands of the warehouse sprinkler system when utilising in-rack sprinklers and therefore the duty requirements of the fire pump. In the U.K., the current LPC (BS5306part2) rules require all levels of sprinklers in the vertical plain to be included in hydraulic calculation as operating simultaneously. Therefore, on a typical high bay warehouse installation with 30m building height, and an average vertical spacing of 2.8m, 10 levels of sprinklers would be assumed operating. Depending on isle widths and category of goods, this could be 3 heads on a range and 3 ranges horizontally. This would give a total number of sprinklers operating of 90 (circa 11700 litres/min). With EN 12845 the same risk would have a maximum of only 27 heads assumed in operation as 3 levels x 3 ranges x 3 sprinklers (circa 3510 litres/min). Therefore all in-rack sprinkler installations installed under EN 12845 will have a maximum flow requirement of circa 6500–7000 litres/min. This will obviously affect the future standard flow requirements of the fire pump.

ESFR INSTALLATIONS

Developments in sprinkler head technology have increased the need for specialised fire pumps for specialist types of sprinkler head. ESFR sprinklers were developed in the 90's to protect many commonly used storage arrangements. Formerly these applications would have been protected with in-rack sprinklers and ceiling protection but ESFR sprinklers removed the need for in-rack sprinklers and produced a solution that called for ceiling protection only. Because of the nature of this head, design principles and operating characteristics differ from conventional sprinkler protection. LPC developed a technical bulletin (TB25) that specifies the requirements and recommendations for the installation of ESFR sprinklers. This technical bulletin becomes TB209 in the EN12845 standards, but the pump demands are the same as specified in TB25. TB25 (TB209) clearly lays out special requirements that are only applied when ESFR sprinklers are utilised, specifying special selection criteria for the pumps that are applied only when utilising ESFR heads. The maximum net positive suction head requirements of the pump reduced from 5.38m on a standard hydraulically calculated system to just 5.0m on the ESFR. This reduces the size of the usable flow range on the pump performance curve from the standard LPC selection. The power coverage requirements of the engine driven pump sets are increased and in addition to this, LPC also insist on a maximum running speed on the engine-driven fire pump package of 2600 RPM. Generally ESFR installations call for a higher-pressure demand at the head than conventional sprinkler heads. Where a standard in-rack sprinkler requires 2 bars at the sprinkler head and the roof sprinkler 0.5 bars at the sprinkler head, the ESFR sprinkler will need 3.5Bar, 5.1Bar or 6.8Bar at the sprinkler head. This creates a demand for higher-pressure pumps for the ESFR applications.

FACTORY ASSEMBLED PACKAGED PUMP HOUSES

Pre-assembled pump house packages are becoming commonplace with many supermarket and D.I.Y. chains insisting on factory built pump house packages. Major industrial users are also seeing the benefit of fabricating the package under factory conditions and insisting on this type of pump house construction. The package requires the pumps to be installed within a custom built housing with all the required pipework, valves, test lines, louvres, heating and lighting normally supplied in a conventional

Pic courtesy SPP Pumps

site-constructed pump house. The pre-assembled units are designed in accordance with the applicable fire rules and regulations and where necessary the applied national construction standards. With all the associated advantages, the factory assembled and tested pump house has become much more convenient to install for both the end user and contractor. The completed unit is offloaded directly on to a pre-cast plinth and the contractor simply needs to secure the unit to the plinth, provide the electric supply into the pump house and pipe in the pumps' water supply. This method of supply reduces the on-site installation time of the pump house by around two weeks and allows the contractor to focus on other parts of the installation.

OIL AND GAS

Although floating production, storage and off loading facilities (FPSO's) have been used in the offshore oil and gas industries since the mid '70s, their popularity only began to boom in recent years. As it becomes financially viable to develop smaller pockets of crude, the FPSO has become more popular with the industry. The unit can be moored over a reserve of crude, harvest the pocket and move on to the next viable mooring. The FPSO utilises the same fire pump duty performance and specification as supplied on conventional oil and gas applications. The package can be installed in a zone 2 hazardous area and supplied to include complex monitoring facilities required for this type of unit. Fire pumps can be installed on the FPSO in a number of ways. One method is to install horizontal fire pumps inside the vessel below the level of the sea chest. This will allow the pumps to operate on a flooded suction condition at any time. Another way of installing fire pumps is to utilise vertical turbine units, mounting the fire pumps at each corner of the vessel with the discharge head at deck level and the hydraulic unit of the pump suspended below sea level, driven by line shaft (driver at deck level) or submersible motor and pumping the fire water up through the suction pipe to fulfil the fire water requirements of the unit.

Increased fire cover has resulted in 2000m^3/Hr flows becoming the norm rather than the exception for oil and gas installations. The fire pumps shown in the photographs are for installation on an FPSO and are of a size that is becoming commonplace in the industry.

HIGH RISE BUILDINGS

Construction of high-rise buildings is on the increase in big cities. The heights of the buildings are rising constantly as ground space becomes even more precious. Usually, fire pumps are mounted at ground or basement level and supply firewater for the sprinkler installation in the building through riser pipes. The sprinkler ranges take their supply from the risers. If only one riser were to be installed in a high rise building then the lower sprinkler ranges would have to find a way to overcome the high pressurse needed to satisfy the demands of the highest level that sprinklers are installed. High pressures are required from the pump to supply the top levels of a high-rise building to overcome the high static distance to the highest sprinkler ranges. This means that the pressures to the lower ranges will be higher than the system components and sprinkler head can handle. Conventional installation procedures cannot be

Pic courtesy SPP Pumps

applied and the contractor has the option of fitting pressure reducing valves or zoning the area to eliminate high pressures on the lower ranges. As pressure-reducing valves are not recommended for this purpose under LPC rules and the rules specifically state that they should only be used for this application when absolutely necessary, zoning becomes the correct method of installation, with European EN12845 rules also insisting on a maximum zone height of 45m. The way of meeting these requirements with an LPC approved and listed pumps is through utilising one single multi-stage multi-outlet pump. This pump has outlets at various stages of the pump, which will pump up to various levels of the building through the separate risers. For example, if the building height is 180m one multi-stage multi-outlet pump with four outlets will satisfy the sprinkler demands for each stage, supplying zones at 45m, 90m, 135m and 180m . This type of pump has a number of stages, determined by the pressure required. When the stages are assembled in series, each stage is supplying the next and the pressure is boosted within the pump. Outlets are taken at various stages down the pump to supply and satisfy the demands of each of the zoned risers. This negates the use of individual pumps and only requires a single driver and control panel to supply the total installation. The photograph shows the Swiss-re building in London, which utilises this type of technology.

Alex Playfair is Business Manager at SPP Pumps Ltd.

Misconceptions ab

Pic courtesy of Pilkington

By Mike Wood of Pilkington

COMPLEXITIES OF DESIGN

Fire safety design is becoming increasingly less a case of just simply applying the rules of prescriptive regulation. Increasingly complex buildings increasingly call for the application of functional design for tailor-made solutions to fit the building, its purpose, owners and users. But, it is far too soon to contemplate casting fire protection design adrift from the anchor of prescriptive guidelines, based as they are on accumulated wisdom. For functional design approaches to be followed with confidence, there is the need to fill in significant gaps in the knowledge base and always the need to rigorously validate fire design models with hard data.

We live in city environments that are becoming more and more complex. Away from the home, our buildings are now high performance structures which have a complex mix of demands placed upon them by the need to blend functionality and robustness with aesthetics, style and creativity in design. The list of multifunctional performance criteria is long. Building efficiency and effectiveness are linked with value for money and integrated design; occupier comfort, thermal insulation, security, safety and sound insulation all have to be considered; and, with longer building working lifetimes in mind, adaptability and flexibility of design together with building serviceability also add to the complexity of demands. In addition, there is the growing question of building sustainability, to minimise impact on the wider environment not only from the buildings themselves but also from the materials used in their construction. An example is the wider recognition on the world stage of the dangers of pcb's (polychlorinated biphenyls) and similar chemicals as flame retardants, because of their putative impact on health and their concentration as toxic pollutants in the human food chain. Discussions are in hand in a number of countries to ban the use of such potentially hazardous chemicals.

Fire design itself is no longer just a question of saving lives and injuries. That is still the pre-eminent goal. But, there are a number of other factors to take into account: not least the tremendous asset value of modern buildings, the costs of insurance, the expense of modern fittings and furnishings, the potential impact on the wider community, potential environmental impact, and the economic consequences of destroyed businesses which are all significant where fire is concerned.

THE IMPORTANCE OF GLASS

Glass has become a very distinctive feature of modern architecture essentially because of its uniqueness in providing natural light and openness in design. Glass is a very adaptable material that can meet many of the modern performance demands at the same time as enhancing the built environment by opening up the building interior. The evidence is there around us in the extensive application of glass in a wide range of modern, stylish residential, commercial, public, and industrial buildings.

My concern is that the necessary appreciation of the behaviour of glass in fire is not sufficient to match the widespread use and application of glass. I fear that there are some fundamental misconceptions which could undermine the basic assumptions of some fire design concepts.

In particular, I have three main concerns:

- firstly, that the natural limitations of standard glass products in fire are not fully appreciated, and that unwarranted assumptions may be taken without a full evaluation;
- secondly, that the differences between different fire-resistant glazed systems are not fully understood and that broad assumptions are made on the equivalence of different fire-resistance glazings, when in fact this conclusion could be fundamentally flawed; and
- thirdly, that the importance of installation is frequently neglected and discounted when in fact it is crucial.

BEHAVIOUR OF GLASS IN FIRE

Standard annealed flat glass is not naturally resistant against fire. Rather the

out glass and fire

Pic courtesy of Pilkington

opposite. The big threat under fire conditions is thermal shock which will lead to cracking and failure within about 5 to 12 minutes. The exact onset of cracking and the subsequent cracking pattern are essentially unpredictable; it is fundamentally a probabilistic process. Pane size, framing conditions, and especially macro and micro surface damage that cannot be seen by eye are all important factors. Double glazing may delay the onset of failure of the second pane by moderating the thermal shock on that pane, but exactly when, and if, depends on the circumstances of the fire and the possibility of flame impingement. A rise of temperature as little as 80°C may be sufficient (and entirely possible in a range of possible fire scenarios). If there is a risk of water impingement on hot glass (e.g. from sprinklers) then it is absolutely critical that the coverage be entirely even over the surface of the glass – a possibility that is difficult to achieve in practical glazed situations, where fittings, furnishings and normally wide transoms, in particular, cast shadows across the glass preventing even coverage. Again assumptions may be implicit in the design scenario which could turn out to be some way from practical reality.

Glasses produced for impact safety are also problematic under fire conditions. Such glasses are widely used in modern building environments. They include thermally toughened glass and laminated glass for both impact and security applications.

Toughened glass is susceptible to unpredictable, catastrophic failure under thermal shock, when a temperature rise or a gradient as little as 200°C may be sufficient to cause failure. Localised heating is a threat to glass integrity. Sensitivity to framing and surface quality is particularly high. In addition, if the glass should survive the initial shock then the thermal conditions in a fire cause the nature of the glass to change as stress relaxation takes place. Even modified toughened glass for fire resistance has to be used under very carefully controlled conditions to minimise the risk and probability of catastrophic behaviour, which may never be entirely discounted even if stipulations on maximum edge cover are observed.

Glass laminated with a plastic interlayer designed for impact and security properties also has limited fire resistance behaviour. The interlayer is organic and under fire conditions it becomes fluid and may ignite. It can therefore burn or give off copious amounts of smoke. Just because the product is laminated and has good impact performance does not mean that the plastic interlayer provides good fire resistance performance. In a fire test, such products deteriorate markedly in 5 to 8 minutes. Failure is typically fast, caused by glass cracking and flaming of the interlayer.

FIRE-RESISTANT GLASS PRODUCTS

Producing a fire-resistant glass capable of standing up to the full range of possible fire conditions, including the most arduous, requires a technology specifically designed for this job. Fire-resistant glass can only function satisfactorily when used within a fire-resistant glazed system also designed for this purpose. This includes framing, materials and fixings. So, a range of fire-resistant framing solutions is needed, developed by specialists in such systems. Focused attention to detail and quality is also needed embracing technology, product testing, manufacturing, and quality control as well as installation.

There are a number of fire-resistant glass products now available. But, it would be a fundamental mistake to assume that they are all alike. In fact

> *Fire-resistant glass can only function satisfactorily when used within a fire-resistant glazed system also designed for this purpose. This includes framing, materials and fixings.*

Pic courtesy of Pilkington

there are commonly quite major differences in important points of detail between the different commercial products, even if the glasses may have at face value the same performance classification. These differences are related to the robustness of the underlying glass technologies used as a basis for the products. Some fire-resistant glasses are simply more tolerant than others of the range of possible fire conditions, because of fundamental differences in technology. The technologies can be significantly different – which is apparent not only in the relative levels and range of performance, the range of glass pane sizes, and the number of framed systems and applications that are approved. There can be significant differences between individual fire-resistant glasses in the relative reliabilities and consistencies of fire performance. One of the key criteria is the ability of the products to give a repeat performance and guaranteed function under varied fire conditions. In this respect a single or a relatively small number of standard furnace test results in isolation, and especially assessments *in lieu* of fire test results, may not be sufficient to answer such reliability and consistency questions.

Above all, what is achievable with one fire-resistant glass may not be achievable with another. Tested approvals apply to particular configurations, glazing sizes, aspect ratios and material combinations. Mixing and matching of individual components between different systems can be dangerous, as they may not be compatible under fire conditions. Unauthorised changes are not allowed; even what appear to be quite minor changes have been found to make a difference, and the effects on performance can be surprisingly unexpected. Different fire-resistant glasses cannot be automatically substituted one for another. Some may not function as effectively as others in the same fire-resistant framing system.

The highest quality of performance and reliability comes from the use of a special intumescent interlayer between glass sheets in a sandwich laminate structure. In the event of fire, the interlayer turns opaque, absorbs heat, insulates with integrity, cuts down radiant heat to tolerable levels and holds the whole structure together as a resilient barrier.

THE CRUCIAL IMPORTANCE OF INSTALLATION

Fire-resistant glass functions within a system, which includes the glass together with the beads, the bead fixings, the glazing materials, the frame and the frame fixings. It is the whole system that has to function as a fire-resistant entity, not just the glass. But, it cannot be assumed that the defined performance will be automatically achieved. The final step, that of installation, is fundamentally important. And yet, it is this aspect that may be neglected.

Any fire-resistant glazed system must

Pic courtesy of Pilkington

be assembled and installed as tested and approved. It is simply counter to recommended best practice to make changes on site, for example to substitute glazing materials if the approved one happens to be unavailable. Standard glazing materials could produce disastrous results in a fire. Any replacements after installation must be made according to the original fire-resistant glazed system specification. And, if that is not entirely clear then the whole system should be replaced.

To be confident of sound installation, it is preferable to use a installer who can demonstrate the necessary knowledge and core competencies required in the installation of fire-resistant glazed systems. One way is to chose a certificated installer under a third party installer scheme, such as FIRAS. The use of such an installer will also provide an increased level of security for the main contractor who may be concerned to limit his potential liability exposure in such a specialist area as fire protection.

LOOKING TO THE FUTURE

The complexity of modern buildings and the unpredictability of fire, both its occurrence and intensity, mean that reliance on a single fire protection system, or one design paradigm to fit all situations, may not be enough. Balanced integrated design is therefore the key. Fire-resistant glazed systems will have a major part to play, because of the central role that glass plays in modern transparent architecture. That role will be in providing compartmentation and fire separation, in protecting escape or access corridors, in fire doors and in glazed facades designed to limit external fire spread from floor to floor or from building to building.

The growth in functional design carries significant implications. Implicit within the functional approach is the need to take a value judgment on the risk of fire occurrence, the nature of the fire hazard, and the potential extent of damage and loss of life should fire occur. Predicting with confidence how the structure is likely to behave, based as much as possible on fact, is therefore critical.

It is crucially important to be aware of the main factors that govern glass behaviour in a fire, and equally important to recognise and dispel the associated misconceptions. Otherwise the levels of fire protection may not be entirely as anticipated, and the fire design models may not deliver building fire performance entirely as simulated.

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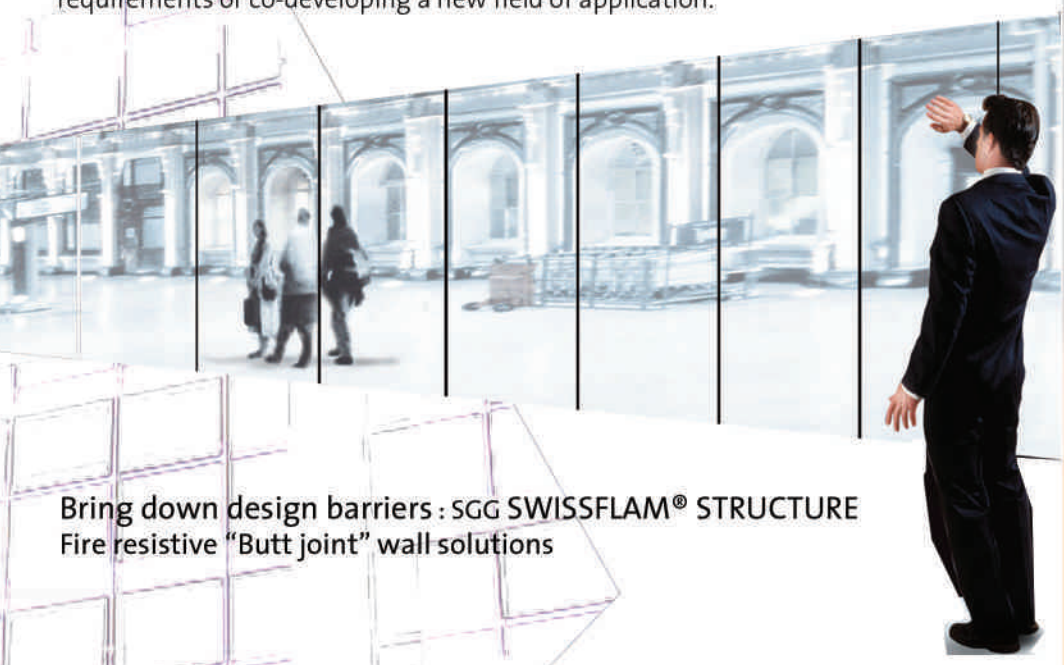

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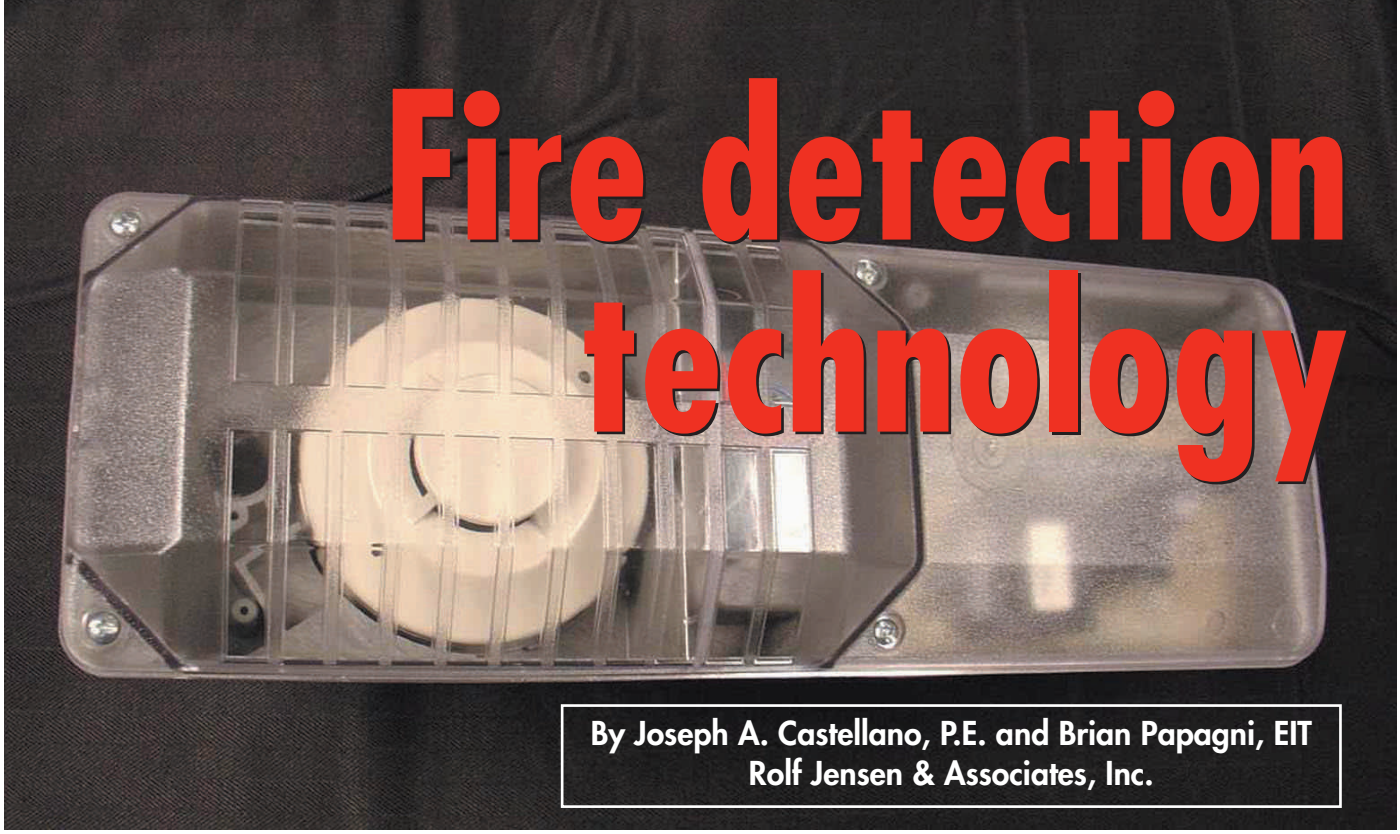


Fire detection technology

By Joseph A. Castellano, P.E. and Brian Papagni, EIT
Rolf Jensen & Associates, Inc.

ARE YOU UP TO THE DESIGN CHALLENGE?

FIRE DETECTION REMAINS a key component in an effective fire and life safety system design. The requirement for fire detection can be found in applicable building and fire codes, fire insurance requirements and as an integral component to a suppression releasing system. The primary objective of a fire detection system is to provide early warning of a fire event. In turn, this will activate facility evacuation alarms, send notification to emergency response personnel, and activate integrated suppression systems.

A designer of such systems has the responsibility to choose from a wide range of system types to provide early warning of a fire event. An understanding of the basic operating principles of each system type is essential to not only selecting a system but providing a cost-effective design for your client. Advancements in technology continue to provide the designer with more options to consider and a greater level of responsibility in keeping up with the latest technology. Simply stated, it is no longer acceptable to rely on the means and methods of previous (similar) designs when technology may offer added benefits over the previous design.

This article will provide an in depth examination of three basic types of detection technology including smoke, flame and heat detection. The basic operating principles of each detection type will be reviewed, along with typical applications and advancements in technology of each system type.

SMOKE DETECTION

Smoke detection can be accomplished through multiple means. These means include ionization detection, photoelectric detection and linear beam detection. Which type of detection is right for your application and what advantages does each type of detection provide to you?

Ionization and photoelectric spot type smoke detectors are a common source of smoke detection in many facilities. Ionization detection uses small amounts radioactive material to monitor smoke and photoelectric detection uses the light scattering of a beam to detect smoke. Both detection techniques work however they have their downfalls. Photoelectric detection is not as effective of smoldering fires and ionization detection is not as effective at detecting flaming fires. Therefore fuel load and fire scenarios must be evaluated before choosing a product.

Spot type photoelectric smoke detectors are also used in air duct detectors for HVAC supply and return ducts. The primary function of an air duct detector is to shut down the HVAC equipment and supply dampers to prevent the migration of smoke throughout the facility.

Linear Beam Detection uses a beam of light projected directly into a sensor at a preset intensity. When smoke intersects the path of the beam, the intensity of the light is reduced and creates an alarm condition. The capability of spanning up to 300 feet enables a single beam detector to take the place of up to ten spot type smoke detectors. This makes beam detection beneficial in long narrow spaces such as tunnels. However, the detectors sensitivity to dust particles can create false alarms.

So what is the best application for each of these detectors? Which detector will provide the quickest response? Which detector will create the fewest false alarms?

These questions are easier asked than answered. Three questions must be evaluated when choosing a type of detection. What is the most common fire scenario? What is the facility geometry? How much can you spend?

As mentioned earlier, photoelectric smoke detection is more effective at detecting flaming fires and tend to have fewer false alarms than ionization detection. However, ionization detection

is much less expensive than photoelectric detection.

Beam detection becomes useful when protecting unique facility geometries. Smoke detection mounted on high ceilings may delay detection time. Beam detection is capable of being mounted below the ceiling or on a diagonal from the ceiling to a lower point on an opposing wall. Beam detection is also beneficial in long narrow spaces such as tunnels. However, the detectors sensitivity to dust particles can create false alarms.

All three of the detection methods above have limitations. As with all technology we are always looking for new and improved methods of detecting smoke. Some of these methods include Air Sampling, Video Imaging and Multi-sensor detection.

Air Sampling smoke detection consists of a series of sampling tubes that continuously take samples of the air in a room and monitor it for the presence of smoke. The continuous samples allow for early detection, which can be critical in areas such as computer rooms or clean rooms where downtime is not acceptable.

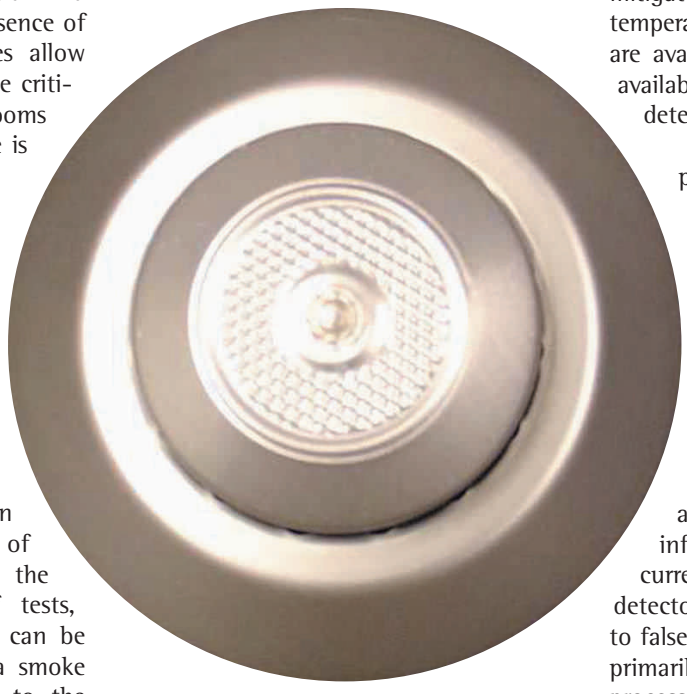
Video imaging is a new technique in smoke detection that has been found to be quite effective in roadway tunnels. Many tunnels already have video monitoring for traffic and safety reasons. Some of these systems can also be used for smoke detection. The system uses image contrast to detect smoke. The introduction of smoke reduces the contrast of the images being viewed by the camera. Through a series of tests, sensitivity to smoke conditions can be calibrated. Upon detection of a smoke condition a indication is sent to the personnel monitoring the cameras. The system has proved to be accurate and cost effective when able to utilize existing surveillance equipment.

Multi-sensor detection incorporates two types of detection in a single unit. Multi-sensor detection is an effective tool to prevent false alarms. The devices are both a smoke and heat detector. Therefore, dust cannot create an alarm condition unless the heat sensor is also activated. Multi-sensor detection is useful for industrial applications.

As can be seen smoke detection comes in many shapes and sizes. Applications vary from road tunnels to clean room to industrial facilities. Both new and old technologies are great tools for protecting your facility from fire.

HEAT DETECTION

Heat or thermal type detection systems are designed to detect the convective heat energy within a fire plume. Three basic types of thermal detection systems consist of fixed temperature, rate-of-rise and rate compensated type detectors. Both the fixed temperature and rate-of-rise detectors are two of the oldest type of detection devices still in use today. These devices have been in use since the early 1900s.



Fixed temperature detectors include both spot-type and linear or line-type detectors. Spot-type is one in which the thermally sensitive element is a compact unit of small area. Spot-type detectors work similar to a thermostat and are typically provided with a range of fixed temperature ratings. Line-type detectors have a thermally sensitive element along a continuous line. The cable incorporating the line-type detector will initiate an alarm upon activation of its rated temperature. Line-type detectors have a distinct advantage over the spot-type detector when determining placement. Line-type detectors offer maximum flexibility to the end user in the relocation of equipment, therefore minimizing the need for future system modifications where the entire area is protected. The use of line-type detectors for the protection of aircraft hangars has become the preferred detection method for these facilities. Fixed temperature detectors are extremely reliable and easier to maintain.

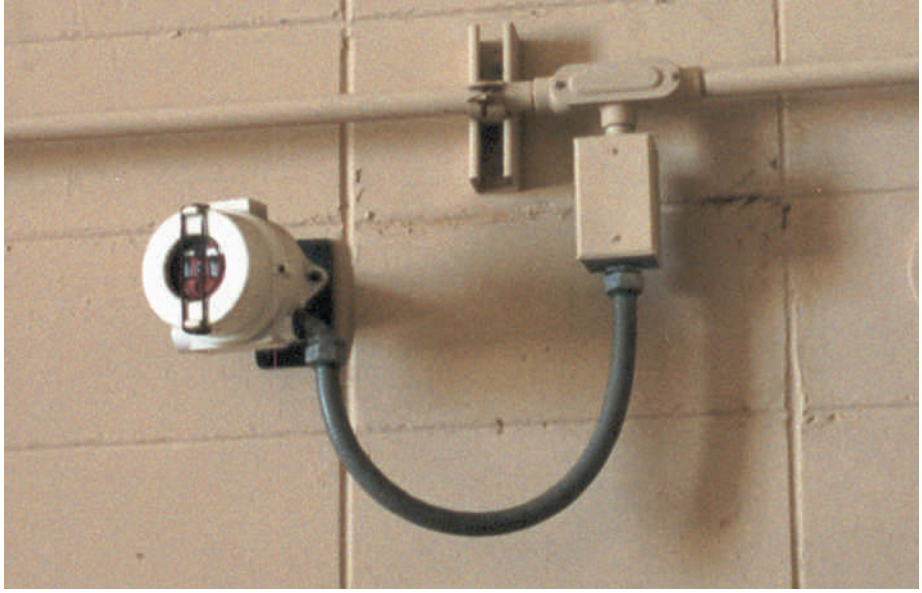
Rate-of-rise detectors operate when the environment experiences a rise in temperature above a preset limit, typically 7°C (15°F) per minute. These detectors are very effective when a fast burning fire is anticipated and less effective for a smoldering or slow developing fire. To mitigate this concern, combination fixed temperature and rate-of-rise detectors are available. These type of devices are available in either the spot or line-type detector.

Rate compensated heat detectors provides both sensitivity to the temperature rise and the fixed temperature. Rate compensated detectors reduce the delay found in fixed temperature detectors and have increased reliability due to minimal false alarms. The rate compensated heat detector is effective for both slow and fast burning fires.

Current technology is showing advancements in the area of infrared heat detectors. While it's current applications are limited, these detectors detect heat and are not prone to false alarms. It's current application is primarily for industrial facilities that process bulk powders and fibers. The

infrared detector reacts to temperatures as low as 175°C, which is well below the 450°-500°C ignition temperature for pulp or wood dust clouds.

The use of heat detectors in high hazard applications continues to be a growing market. This is especially true for linear type detectors. Current applications include aircraft hangars, freezer storage warehouses, cooling towers, tunnels, computer rooms, cable trays, fuel distribution terminals, offshore platforms, tank farms, etc. Both the reliability and maintainability of these linear type heat detection systems has increased their acceptance in a wide variety of applications.



FLAME DETECTION

Flame detection is critical when protecting fuels that are likely to combust without smoldering. Flammable liquid storage facilities and fueled aircraft hangars are two such facilities that often use flame detection. Flame detection can be categorized into three main methods. The three methods are Ultraviolet (UV), Infrared (IR) and Visible. The three detection methods can be used independently or as a combination such as UV/IR detection. All three methods are based on monitoring ranges of light frequencies.

UV detection sensitivity ranges from frequencies of 0.01 µm to 0.35 µm. This allows the detector "see" the ultraviolet frequency emitted from a fire as well as OH, CO_2 and CO flame emissions. UV flame detection does have a tendency to create false alarms due to arc welding. This has proved detrimental in many aircraft maintenance hangars.

IR detection detects fires emitting frequencies in the range of 0.77 µm to 220 µm. The large range allows for the detection of flame from many fuel types. However, the sensor has to be set to a specific bandwidth. Therefore, if the bandwidth is set for a non-carbon based fuel and a carbon based fuel is involved in the fire, the detector will not acknowledge the fire. IR detection also has created false alarms in the past due to solar radiation.

Visible detection uses the frequency range from 0.30 µm to 0.77 µm, the visible light range. Detection is accomplished via video cameras and uses flame color to indicate fuel type and O_2 fuel ratios.

The most prominent detection is UV and IR. However, as indicated both systems have certain flaws. In order to overcome false alarm issues, which at time actuate foam suppression systems, creating an unwanted, even hazardous effect, devices have been designed to provide multi-sensor capability.

UV/IR devices are used to increase sensitivity and decrease false alarms. The devices monitor radiation in both the UV and IR bandwidths. With the use of a microprocessor the devices are able to acclimate to a multitude of environments.

IR^3 detection and UV/IR^3 detection provides similar protection but on multiple bandwidths. This feature monitors up to three different bandwidths allowing the detection of multiple fuel fires. IR^3 devices have been found effective in detecting fire and providing a low false alarm rate.

CONCLUSION

Technology continues to change the world around us, including the fire detection industry. Manufacturers are putting more money into R&D to develop new fire alarm technologies that will give them a competitive edge in the market. The engineering and design community working with the end users, has the challenging responsibility of gaining a complete understanding of how the facility is to be used. This information will allow them to better assess the fire hazards and make recommendations to the client as to the best available technology and associated costs for the specified application.

As technology advances and our knowledge base of fire protection grows, fire loss will decrease and life safety will increase. The use of new technology provides accurate, early warning that allows for safer facilities.

Mr. Joe Castellano, P.E. is the Engineering Manager for the Atlanta, GA office of Rolf Jensen & Associates, Inc. (RJA) along with Mr. Brian Pagani.

Rolf Jensen & Associates, Inc. (RJA) is a professional services firm providing fire protection and life safety consulting services to clients on projects around the world. To learn more about RJA, visit their website at www.rjainc.com

ALARM PANEL SHOWCASE

This showcase contains product information from some of the world's leading manufacturers of Alarm Panels. It will make an excellent reference source. We will also publish this showcase on our website www.ifpmag.com

AUTROSAFE FIRE ALARM CONTROL PANEL BS-310G (G2) AND BS-320G (G2)

AutroSafe Fire Alarm Control Panel BS-310G (G2) and BS-320G (G2) are complete fire alarm control panels with full operating capabilities, specifically designed for the *AutroSafe Integrated Fire and Gas System* (IFG): the world's first integrated fire and gas detection system for oil, gas and petrochemical industry.

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With a LON interface, the panels can communicate with other system units on the local operating network, AUTROLON.

With the AutroFieldBus and Powerloop drivers, 4-20mA input units, plus protocol converters, the panels can be part of a system providing total integration of fire and gas detection and warning, including beam detectors, point gas detectors, aspirating detectors, high-sensitivity smoke detectors, heat detectors, oil-fume detectors and flame detection based on CCTV technology, plus AutroOS (an integrated graphical control and monitoring system).

Using the ModBus Interface, the panel provides connectivity with programmable logic systems, as well as SIL2-approved connectivity using ProfiBus /ProfiSafe.

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Fire Control Instruments (FCI), a part of Honeywell Fire Solutions Group, is a performance and technology leader in the life safety systems industry for commercial, industrial and educational applications worldwide. Utilizing high-speed networking and fiber optic communications, FCI combines intelligence with high reliability to produce an exceptional line of fire alarm systems.

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Panels Feature Advanced Auto-Programming Capabilities to Reduce Installation Time and Overall Cost

Fire-Lite Alarms, part of Honeywell's (NYSE: HON) Fire Group, the leading manufacturer of quality life safety systems, offers a complete line of addressable fire alarm control panels, including the MS-9200, MS-9600 and MS-9200UD. All three panels feature advanced auto-programming capabilities, reducing installation time and overall cost. Fire-Lite's addressable panels allow an entire system to be auto-programmed with the touch of a button, which reduces programming time. Manufactured with surface-mount technology, Fire-Lite's MS-9200, MS-9600, and MS-9200UD panels feature the latest in fire protection innovation, including automatic detector test capability, drift compensation and maintenance alert.

The MS-9200 is designed for smaller buildings and supports up to 198 addressable devices on one loop. The MS-9600 can support up to 318 devices on one Signaling Line Circuit (SLC) or a total of 636 addressable points with an optional second loop (SLC-2). Additionally, the MS-9600 offers an optional 14.4K Baud modem (DACT-UD) for remote site

upload/download and/or remote monitoring. The MS-9200UD is the newest and most technologically advanced of the three panels. By crossing both the MS-9200 and MS-9600 users get a smart new solution that is heavy on features and light on cost. The MS-9200UD features a built-in communicator, remote site upload/download capability, and selectable strobe synchronization. The built-in communicator is compatible with 14 different formats, including the popular Ademco Contact ID. This allows the reporting of addressable point or software zone status without having to purchase an optional DACT (Digital Alarm Communicator Transmitter).

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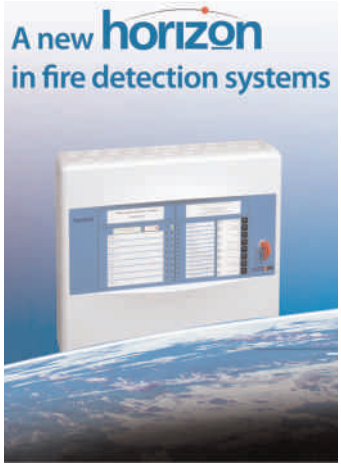
2, 4 AND 8 ZONE CONVENTIONAL FIRE CONTROL PANEL IS INSTALLER- AND USER-FRIENDLY



The new Horizon range of conventional fire control panels from **Morley-IAS** provides installers with the same 'out the box, on the wall' benefits found in the company's addressable panels, while for users, the units incorporate many advanced features normally only found in larger systems. Designed for use in schools, garages, retail units, community centres, doctors' surgeries, smaller hotels, guest houses and other commercial premises, Horizon is available in 2, 4 or 8 Zone versions. It is optimised to take full advantage of the enhanced features available in the latest Horizon conventional detectors and devices from other approved manufacturers.

For the installer, an intuitive 'Quick Start Guide' is provided, enabling the system to be configured extremely quickly. For the end user, Horizon offers sophisticated options designed to minimise the incidence of false alarms, such as coincidence detection, where two detectors in adjacent zones must go into alarm before the panel initiates the sounders. Programmable delay to allow trained staff members to investigate the source of the indicated fire, and compatibility with the latest multi-criteria detectors, ensures that Horizon will detect an actual fire as quickly and reliably as possible without frequent false alarms. As an incidental benefit for schools, a 'class change' input allows sounders to be activated to mark the end of lesson periods.

Horizon is housed in a flame retardant ABS enclosure, 318 x 356 x 96mm, fitted with top and rear cable entry knockouts. 2, 4 or 8 detector zones, two sounder zones, two configurable digital inputs and an auxiliary power output are provided. An optional relay output card enables fire and fault signals from Horizon to be integrated with other systems installed in the premises.

For more information please contact
Morley-IAS
Tel: + 44 (0)1444 235556
www.morley-ias.co.uk

NFS2-8 CONVENTIONAL FIRE ALARM CONTROL PANEL IS USER AND INSTALLER FRIENDLY

Released 2 July 2004
NOTIFIER Fire Systems' new NFS2-8 conventional fire control panel family is designed for applications such as offices, retail units, bars, restaurants, schools, nursing homes, small hotels and

other similar commercial premises. Designed to EN54 parts 2 and 8, the NFS2-8 2, 4 and 8 zone system incorporates much of the sophisticated functionality normally provided only by larger, addressable systems, giving increased protection for the building and its occupants.

The Day/Night mode delay switch gives trained staff time to investigate an alarm when the building is occupied; as an additional safety measure, operation of a manual call point instigates an immediate alarm at any time. At night, the system can be set to initiate immediately both local and remote alarms. In multi-building facilities, the NFS2-8 can be inter-linked with other independent systems to provide full campus-wide coverage; it can also be monitored by existing systems when a facility is extended. As an additional benefit for schools, the digital outputs can be configured to allow the sounders to be activated to mark the end of lesson periods. 72 hour battery back up means that the fire protection system will remain operational if power to the premises is interrupted. For the installer, the NFS2-8 offers compatibility with virtually all detectors available on the market, making it ideal for both new build and retrofit use. A "Walk-Test" function makes commissioning the system and testing the individual detectors a simple one man job.

For more information please contact
NOTIFIER
Tel: + 44 (0)1444 230300
www.notifierfiresystems.co.uk

SILENT KNIGHT INTRODUCES THE 5808 127-POINT ADDRESSABLE FIRE ALARM CONTROL PANEL

New Panel Offers Built-In Digital Communication and Distributed Intelligent Power With an Easy-to-Use Interface

MAPLE GROVE, Minn. – Silent Knight, part of Honeywell's (NYSE: HON) Fire Group, offers industry-wide compatible fire alarm solutions for small to mid-size institutions and commercial sites. Silent Knight introduces its IntelliKnight 5808 Fire Alarm Control Panel (FACP).

The IntelliKnight 5808 FACP offers

built-in digital communication that allows reporting of all system activity to a remote monitoring location. The 5808 supports up to 127 addressable devices that allow the user to pinpoint which device has been activated and/or needs attention. It also uses drift compensation, maintenance alert and a distributed power scheme to simplify installation and reduce wiring requirements.

The basic IntelliKnight 5808 system can be enhanced by adding modules such as the 5860 Remote Annunciator, the Model 5824 Serial/Parallel Interface (for printing system reports) and an intelligent Power Module. It also offers a built-in RS-232 interface for programming to a PC.

Silent Knight, part of the Honeywell Fire Group, offers industry-wide compatible fire alarm solutions sold through both security equipment distributors and engineered systems distributors.

For more information please contact
Silent Knight
www.silentknight.com

Avoiding BLEVEs – What are the options?

WHEN SEALED VESSELS OF liquefied gases such as bullet tanks or spheres are accidentally exposed to and enveloped by fire, a BLEVE can occur. The results can be appalling and any person responsible for the fire-proofing of any such structure should be fully aware of what standards exist and what remedies are available.

By The Association for Specialist Fire Protection (ASFP)

BLEVE may be a new term to you. It stands for Boiling Liquid Expanding Vapour Explosion. As a vessel's external temperature increases, vapour is generated inside causing the internal pressure to increase rapidly. During this process, the wall temperature rises in the empty part of the tank or sphere, gradually weakening its strength. Eventually the increased internal pressure exceeds the strength of the wall. At this point the vessel will rupture releasing superheated liquid which expands and vaporises in seconds adding further fuel to the fire and resulting in a fireball that is likely to cause catastrophic damage. This can also occur even when a pressure relief valve has been activated to vent the vessel.

In order to reduce the risk of a BLEVE, the vessel's wall temperature must be kept at a certain level, for a set period of time, in order to prevent rupture and allow the fire to be extinguished. This protection can be achieved by the discharge of water on to the vessels at a rate sufficient to maintain an adequate film of water over the surface of the vessels and supports. Vessels may also be protected from radiant heat by burial, mounding, or other methods such as insulating coatings providing an equivalent standard of protection to adequate water drench systems (i.e. monitors or fixed sprays) can be achieved. Where these methods are used, water for fire protection need not be provided except for the unprotected manholes on underground or mounded vessels.

In order to reduce the risk of a BLEVE, the vessel's wall temperature must be kept at a certain level, for a set period of time, in order to prevent rupture and allow the fire to be extinguished.

Vessels may also be protected from radiant heat by burial, mounding, or other methods such as insulating coatings providing an equivalent standard of protection to adequate water drench systems (i.e. monitors or fixed sprays) can be achieved.

Standards and codes for the protection of LPG vessels include, the LP Gas Association's COP1 'Bulk LPG storage at fixed installations' and the American Petroleum Institute publications API 2510, API 2510A and API 2218.

Work carried out by several companies, together with the Health and Safety Executive, has established that the application of 9.8 litres, per square metre, per minute, of water is sufficient to protect a vessel from the effects of a pool fire or the radiant heat from a nearby fire. In the event of a fire, water

Avoiding BLEVEs – What are the options?

drench systems are activated either automatically or manually and in view of this, consideration has to be given to the time lag between the fire breaking out and the actual activation of the system. In addition, water drench systems consume large amounts of water, for example a 23 metre diameter sphere would require approximately 310,000 litres of water per hour, excluding any additional water that might be required to protect any adjacent vessels or structure or for fire fighting. If the fire has spread from a nearby location there is also the possibility that the water drench system may have already been damaged and thus may not work effectively when activated. Water drench systems require regular maintenance to ensure that piping is in good condition and that nozzles are not blocked, which might lead to insufficient water being applied to some areas of the vessel thus causing 'hot spots' and possibly premature failure in these areas.

Burial or mounding fire protection techniques can also be effective as the fire is unable to engulf the vessel. With this type of fire, however, protection inspection and maintenance of the vessel and its ancillary systems is often difficult. Small leaks, in pipe-work for instance, can prove impossible to detect. Ground water can pose problems for the vessel through corrosion and 'floating', while earth movement may also cause damage.

Passive fire protection products such as slab/mat materials clad in with steel or those based on cementitious, intumescent technology can also be used to protect vessels. They offer many benefits; the main one being that the fire protection is not reliant on a system that requires activation either automatically or manually. If properly applied by experienced installers, passive fire protection products require little maintenance and thus their through-life cost is low.

Passive fire protection products for vessel protection; those that follow a hydrocarbon fire time temperature curve, are fire tested to different standards to their counterparts in the commercial building industry. They need to be! In hydrocarbon tests fire temperatures of 1100°C are reached within 5 minutes, whereas in cellulosic fire tests (those used for commercial buildings) the temperature will only rise to 500-600°C in the same time period. Hydrocarbon standards/tests include BS476: Part 20; 1987 Appendix D, Underwriters Laboratory 1709, Factory Mutual Standard 'Fire Protection Coatings for LP Gas Steel Storage Vessels and Process Structures' and the Norwegian Petroleum Directorate 'H' Class Test.

- In addition to the above tests, many of the hydrocarbon rated passive fire protection products have also been successfully tested and proved to withstand torch fires. Such fires may occur in a hydrocarbon processing facility when a gas line ruptures and causes a high intensity fire to impinge upon a very small area of a vessel or structure.
- The durability of hydrocarbon rated passive protection products is of a very high level and has been demonstrated both by accelerated testing and by actual installations that date back to the mid 1970s.
- Explosion testing has proved that these materials will remain on the substrate and stay in place to withstand any fire that may follow.

Small leaks, in pipe-work for instance, can prove impossible to detect. Ground water can pose problems for the vessel through corrosion and 'floating', while earth movement may also cause damage.

In summary, the engineer has a choice when considering how to provide fire protection to LPG vessels, with all systems having their plusses and minuses. Provided they are properly installed and maintained, all systems will help to avoid a BLEVE. If in any doubt with regard to design, further advice should be obtained from the relevant Government Agency, Trade Association or manufacturer.

The ASFP is located at Association House, 99 West Street, Farnham, Surrey GU9 7EN. Tel: 01252 739142. Fax: 01252 739140. Email: info@associationhouse.org.uk Web site: www.asfp.org.uk

HIGH QUALITY HEAT EXCHANGERS FOR FIRE PUMPS AND SPRINKLER SYSTEMS

Bowman is a manufacturer of high quality header tank heat exchangers for use on diesel engine driven fire pumps and water mist and sprinkler systems.

The heat exchangers are used to cool the engine water. The mains water supply that flows through the tubes in the heat exchanger cools the engine water that flows over the tubes. These heat exchangers are a superior alternative to an air cooled radiator system.

Bowman manufactures a large range of header tank heat exchangers suitable for engines from 40kW (54HP) to 1400kW (1876HP).

The heat exchangers incorporate a quite zone header tank with a special deaeration feature and a pressurised filler cap. The removable tube stack is held in position by 'O' rings and is free to expand and contract within the cast housing, thus minimising thermal stresses. It can easily be removed should cleaning be necessary.

Bowman manufactures heat exchangers for a variety of industries including the marine, power, mining and automotive industries as well as the fire pump market. Bowman is already supplying heat exchangers to major fire pump manufacturers in the UK, Europe and further afield.

For further information, please contact:
EJ Bowman Ltd
Tel: 0044 (0) 121 359 5401
Email: info@ejbowman.co.uk
Website: www.ejbowman.co.uk

HIGH OUTPUT EX SPEAKER FROM MEDC

30 Watts, Up to 122dBA, Model DB16

ATEX Approved & UL Listed

MEDC, the manufacturer of alarm, signal, control and communications equipment for potentially explosive atmospheres and harsh environments is pleased to announce the launch of its latest loudspeaker for hazardous areas, the DB16.

This new product has been ATEX approved and UL Listed for hazardous and ordinary locations.

With a high ingress protection rating and heavy duty construction this unit is ideal for industrial applications both onshore and offshore. Acoustically engineered to optimise output, this unit offers ease of installation with an integral terminal chamber and further increases the company's capabilities in the communications market.

Outline specifications are:

- **Application** — Zone 1 & 2 (Gas & Dust) use.
- **ATEX** — ATEX approved Ex II 2GD (model dependent).
- **UL Listed** — UL Listed for Class I, Div 2, Groups A-D (model dependent)
  UL Listed for Class I, Zone 1 AExde IIB/IIC T3/T110°C
- **Ingress Protection** — IP66 & 67/NEMA 4x & 6.
- **Ambient Temperature** — –50°C to +40°C.
- **Maximum Output** — Up to 122 dB(A) at 30 Watts at 1 metre.
  Up to 107 dB(A) at 1 Watt at 1 metre.
- **Rated Power** — 30 Watts RMS.
- **Material** — Corrosion-free GRP and stainless steel construction.
- **Options** — 100V line transformer as standard, other values & direct (8 ohm) tappings available.

For more information please contact:
MEDC Ltd
Tel: +44 (0)1773 864130
Email: mknox@medc.com

LumiNova® is a class of newly developed phosphorescent (glow-in-the-dark) pigments which are based on strontium aluminate chemistry. They are drastically different from conventional ZnS based pigments. LumiNova® pigments are in the TSCA inventory and are awarded patents in 18 countries worldwide. With sufficient dosage and full light-charging, LumiNova® glows practically all night long without the aid of any radioactive substances.

LumiNova® was invented and developed by **Nemoto & Co., Ltd.** in Japan (www.nemoto.co.jp). Nemoto has been in the luminous pigments business since 1941 and is one of the leading phosphorescent pigments manufacturers in the world.

The main features are: ten times stronger and longer afterglow (comparison with the conventional ZnS based materials), excellent weatherability and light-fastness, and the fact that this material is free of hazardous radioactive substances

LumiNova® can be applied by painting, printing, and plastic incorporation etc. for specific applications such as safety signs and low level lighting escape systems, electronic instruments dial pads, home appliances, lighting apparatus and switches, aircraft and automobile dials and instrument panels, firemen's equipment, fishing equipment, military applications and many more depending on product designers' imagination!

LumiNova® is sure to revolutionize the glow-in-the-dark products' field. Its superior light fastness combined with its high initial brightness and long afterglow will create new opportunities for companies that were limited by the restrictions placed upon them by conventional phosphorescent pigments.

For further information, please contact:
Nemoto & Co. Ltd.
Email: intsales@nemoto.co.jp

CLEAN AGENT INERT GAS FIRE SUPPRESSION SYSTEM

Nohmi Bosai Ltd. has developed gaseous fire suppression system called NN100 to satisfy consumer demands toward safety against human and their property. Also it unique feature that only nitrogen, the gas of 78% in the air, is employed as an extinguishing agent, the NN100 totally unrelated to environmental problems (Zero GWP, Zero ODP). Since launching NN100 into the market in 1995, its technical advantage, safeness and Japanese quality have been received well by customers, which leads more than 1000 installation records.

UL approved NN100 designed for total flooding protection

against Class A surface burning, Class B flammable liquid and Class C fires. NN100 is also authorized by NFPA2001, EPA (Environmental Protection Agency), UNEP (United Nations Environment Program), and many local authorities from Japan, South-East Asia, and Middle East counties.

Typical applications of NN100 are computer room, telecommunication facility, and electrical/mechanical room where expensive equipment located. Besides its features that the nitrogen gas causes neither corrosion nor condensation during discharging, nitrogen itself has an advantage that its name "nitrogen" is familiar with public people, which prevents panic situation when they hear the announcement saying, "nitrogen gas will be discharged". With this reason, art/national museum occupied by many strangers is also suitable application of NN100.

Other Features of NN100

- Cylinder valve having a pressure regulating function allows NN100 to supply stable discharge pressure.
- UL approved 30MPa storage cylinder realizes having fewer cylinders and minimizing space for cylinder space.
- Nitrogen gas is commonly available as it is not synthetic nor blended gas. Refilling the nitrogen gas is easy to handle.

NN100 is available from our distributors in Thai, Indonesia, Philippines, Vietnam, Singapore, Malaysia, China, Taiwan, Jordan, U.A.E., Kuwait, Qatar, Tunisia, Bangladesh, and India.

For more information, please contact:
Nohmi Bosai Ltd
Tel: +81 33265 0231
Website: www.nohmi.co.jp

NO CLIMB STEPS UP MARKETING

No Climb Products Limited, leading manufacturers of test and service equipment for fire detection systems, has appointed a Marketing Manager, Caryn Cooper, to strengthen the company's marketing activity. Caryn, who arrives from the IT and Business Consultancy arena, is responsible for promoting No Climb's existing product lines, as well as launching new products into the global marketplace.

"Caryn brings with her a breadth of marketing experience in the business world", said Torben Cox, Sales and Marketing Director of No Climb, "which is ideally suited to the company's extensive investment into R & D and plans for growth worldwide."

For more information, please contact:
No Climb Products Ltd
Tel: +44 (0) 1707 282773
Fax: + 44 (0) 1707 282777
Email: caryn.cooper@noclimb.com
Website: www.noclimb.com

PYROZONE LOW-PRESSURE CARBON DIOXIDE FIRE SUPPRESSION SYSTEMS NOW AVAILABLE IN THE MIDDLE EAST THROUGH NAFFCO

National Fire Fighting Manufacturing Company FZCO (NAFFCO) has linked up with the Australian manufacturer of Pyrozone LP-CO2 Fire Suppression Systems to make this unique programme available in the Middle East.

Pyrozone Manufacturing Pty Ltd invented/developed the underlying LP-CO2 modular storage programme as a high-pressure CO2 replacement technology for the Australian hospitality industry where it is now widely used to pressurize beverage reticulation systems in hotels and restaurants.

Following its adaption for fire-protection applications in the early 1990's, Pyrozone Gaseous Systems enjoy increasing levels of acceptance in Australia and many parts of Asia, by providing flexible, reliable and cost effective solutions for protecting 'special hazard' industrial risks.

Pyrozone LP-CO2 systems have one of the lowest 'Cost of Ownership' profiles of any fixed gaseous system technology and are backed by Scientific Services Laboratory Listing (SSL) & FM (Component) Approval.

NAFFCO, an ISO 9001 certified company based in Dubai, UAE backed by its in-house expertise in areas of system design, engineering and logistics is now the official distributor of Pyrozone LP-CO2 Systems in the Middle East Region.

For more information, please contact:
National Fire Fighting Manufacturing Company
Tel: +971 4 8815653
Fax: +971 4 8816229
E-mail: khalid@naffco.ae
Website: www.naffco.com

LIFETIME WARRANTY FOR SOLO™ DETECTOR TEST EQUIPMENT

Customers buying **Solo™** fire detector test and maintenance tools can now benefit from a **Lifetime Warranty,** thereby underlining the confidence that users can have in both the products and the technical expertise and experience of the company behind them.

Designed in house by a dedicated team of staff with many years of experience in the field, the innovative and carefully researched Solo products are manufactured from the highest quality components and to demanding specifications and tolerances before being submitted to rigorous finished product inspection. All under a quality management system approved to ISO 9001:2000.

It is in the field that Solo products truly show their durability and value. Over the years since it was first created Solo has proven itself to be the reliable and trustworthy range of detector testers that fire professionals demand.

Torben Cox, Sales and Marketing Director of No Climb, the company behind Solo explains: *"This Lifetime Warranty demonstrates the company's belief in it's products and confirms to the customer that Solo equipment will not let him down. More than that, its assures that Solo can be relied upon for many years of dependable service. People expect these products not just to work well, but to last. Our team is behind every aspect of the product, from concept to creation, which means that this warranty ensures the best product and technical support available, on top of outstanding product performance. The difference, if you like, between price and value!"*

For further information, please contact:
No Climb Products Ltd
Tel: +44 (0) 1707 282773
Fax: + 44 (0) 1707 282777
Email: caryn.cooper@noclimb.com
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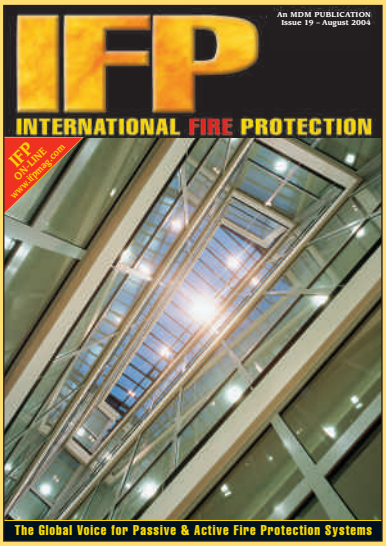

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* 67 Fed. Reg. 77927 (Dec. 20, 2002)

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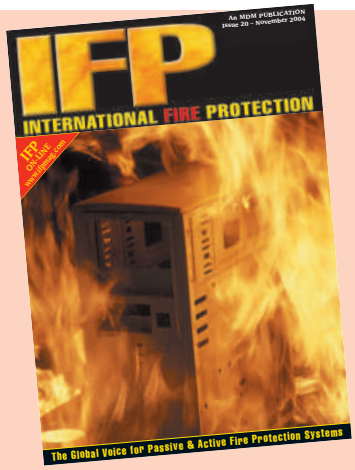

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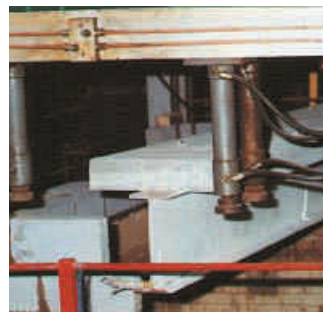

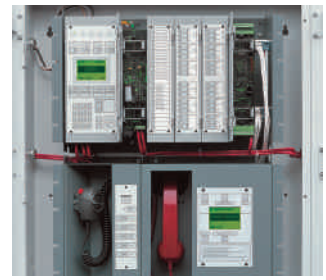

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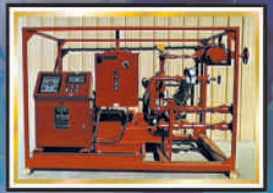

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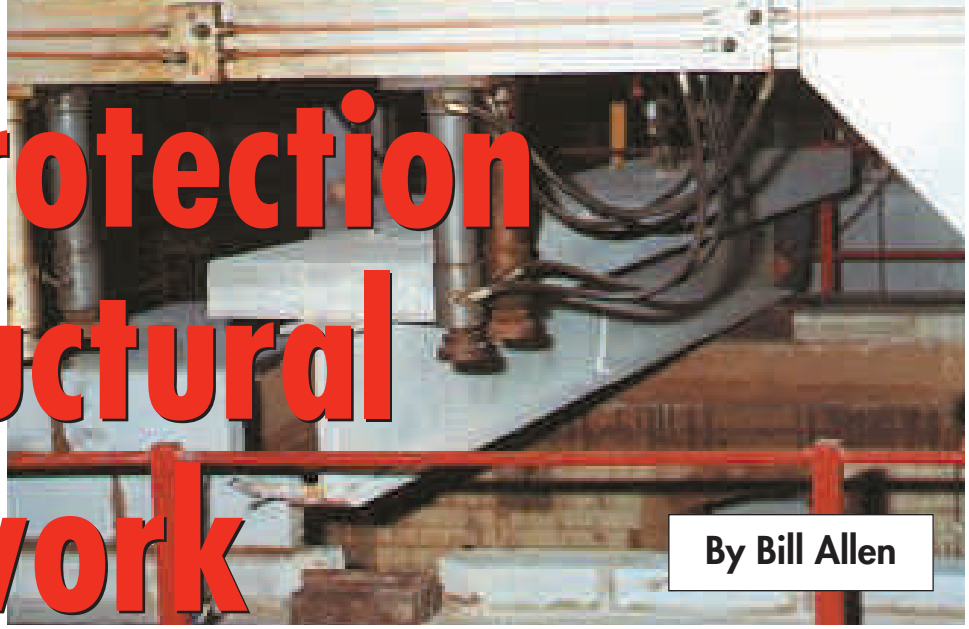
Fire Protection of Structural Steelwork



By Bill Allen

Steel beam before fire test

Using Intumescent Coatings

What happens to steel in fire?

In many parts of the world, structural steel is the first choice of architects and engineers for the framework of single and multi-story buildings.

Steel offers maximum design flexibility and is widely used as an architectural feature in its own right. Intumescent coatings provide the ideal solution to satisfy both architect and specifier, in providing corrosion protection, fire protection and decoration.

The combined use of steel construction methods and the use of intumescent fire protection have proved the most cost effective and reliable in many different situations.

Alternative construction materials such as concrete can lead to slower erection sequences and heavier foundations.

In a fire situation, a steel-frame building designed to maximum permissible design stress in accordance with BS 5950 Part 8 and Eurocode 4, the steelwork will rapidly lose its structural strength at temperatures in excess of 550°C.

The rate of heating of the steel can be greatly reduced by the use of insulating materials such as intumescent coatings, thus extending the time taken for the steel to reach its critical temperature.

The primary objective being the prevention of structural collapse, which in turn will provide adequate means of escape for the occupants and ensure the safety of rescue services.

APPROVED DOCUMENT B – FIRE SAFETY

Fire protection has now become an essential requirement of steel construction and in most countries; the Building Regulations (or each countries equivalent) specify periods of fire resistance, depending on the height and function of the building. These fire resistance periods can vary depending on whether or not the building is protected by sprinklers or other 'active' methods of fire protection.

Steel beam after fire test

Approved Document B states "The building shall be designed and constructed such that, in the event of a fire, it will maintain its stability for a reasonable period".

The required periods of fire resistance are frequently listed in a tabular format relating periods of fire resistance to building height and type of occupancy although other factors such as compartmentation will need to be considered.

It is important to note that the Building Regulations, Approved Document B – Fire Safety is only concerned with safety of life, and insurers may require further measures to protect property as well.

HOW INTUMESCENT COATINGS WORK

Intumescent coatings are normally applied by airless spray to provide a smooth decorative finish, which remains stable at ambient temperatures.

These coating compositions are based on organic resin binders, which are typically acrylated rubber or epoxy. The resins are filled with active ingredients, which react in a fire at temperatures around 250°C to form a thermally insulating carbonaceous char or foam. The char can be expanded up to 50 times the original coating thickness.

The char reduces the rate of heating of the steel and hence

Fire Protection of Structural Steelwork

Using Intumescent Coatings

prolongs its load bearing capacity.

As described above the basic formulation of an intumescent comprises of an organic binder, a carbonific, usually a penta or dipentaerythritol, a spumific or blowing agent which could be melamine or a melamine formaldehyde derivative, a source of an acid catalyst such as ammonium polyphosphate or boric acid and finally a char reinforcement pigment such as glass flake or micro spheres.

As the temperature rises causing the binder to melt, the blowing agent liberates gases causing a controlled expansion. At the same time there is degradation of the carbon backbone and fusion of the inorganic reinforcing materials, resulting in char solidification.

STRUCTURAL STEEL

The fire resistance of an element of a steel structure is determined by its size, shape, orientation, applied forces, the core temperature, and the perimeter exposed to the fire.

In the United Kingdom, the performance of fire protected structural steelwork is assessed using BS476: Part 21. The test method includes procedures for both flexural and compression members (beams and columns).

In addition, there is now a European Standard, ENV 13381-4, which seeks to harmonise the method of test and assessment between member States.

For the purpose of loaded fire testing, generally, the maximum design force is applied to the steel member as determined by BS5950 Part 8.

For beams the load is applied via hydraulic rams through the concrete slab to simulate steel beams supporting a concrete floor.

This is generally referred to as 3-sided exposure because the concrete is protecting the upper face of the beam from exposure to fire.

The steel beam section is deemed to have failed when it can no longer support its designed load. The Fire Resistance of the section is the time taken for the deflection in the centre of the section to reach Exposed Length divided by 30 (this is normally 150 mm) or when the rate of deflection exceeds the safety limit given in BS476 Part 20.

The graph on page 6 shows the BS476 heating curve, and the rate of heating of a steel beam both unprotected and protected with a 60-minute thickness of intumescent coating.

In the column test, the exposed length of steel section is typically 3 metres and all faces of the column are exposed to the fire. The load is applied vertically via a hydraulic ram exerting compression forces to the column, see diagram below

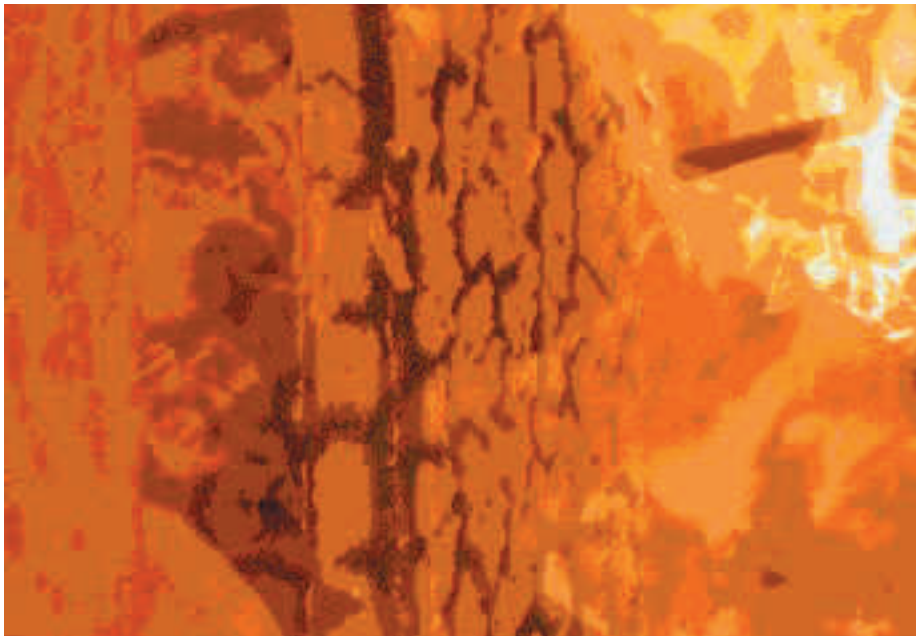
This is generally referred to as 4-sided exposure.

The steel column section is deemed to have failed when it can no longer support its design load, and this is generally when the column, whose expansion in the fire has been accurately monitored, has been compressed back to its original length. The temperature at which this occurs is the critical steel temperature, and the time taken to reach that temperature is the fire resistance of the section.

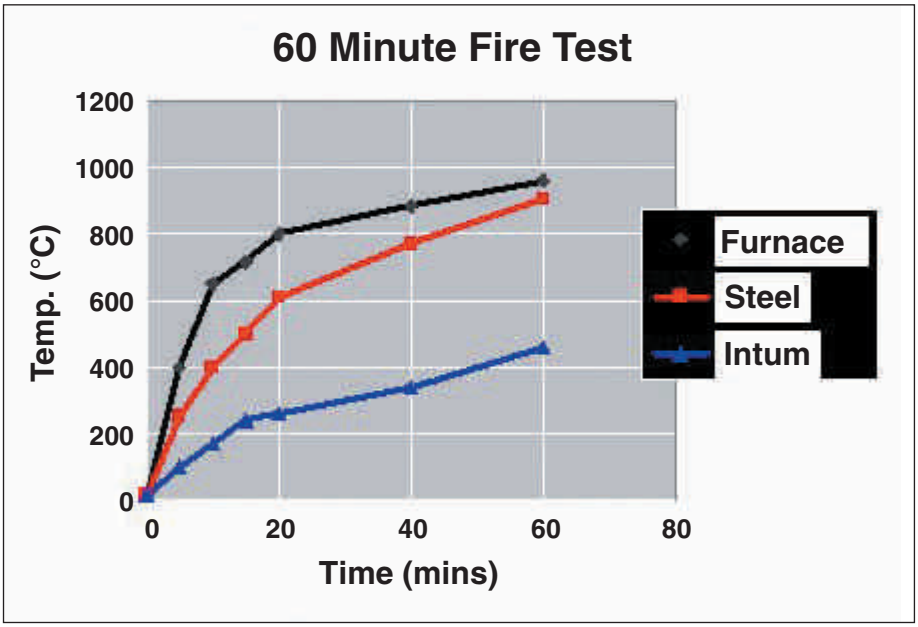
Full scale loaded fire tests on beams are essential to provide information on insulation and stickability properties of Intumescent coatings at their maximum applied thickness. These tests must be carried out at UKAS (or equivalent) approved laboratories. The Fire Resistance achieved is only applicable to the particular section under test for the known thickness of the Intumescent Coating System applied.

In some fire test programmes the loaded column test may be replaced by a similar but unloaded tall column to determine whether the intumescent material slumps in the vertical plane. This is one option given in ENV 13381-4.

It becomes cost prohibitive and certainly not a very practical proposition to carry out the full scale testing of all



Steel column coated with intumescent in test furnace



sizes and shapes of steel in every orientation at a selection of coating thickness. It therefore became desirable to devise a programme of exploratory tests to enable the performance of intumescent coating systems to be assessed on a selected range of beam and column sizes. The variables explored in an assessment approach are Section Factor (Hp/A see later explanation), protection thickness and the fire resistance time to reach 550°C for columns and 620°C for beams.

A typical fire test assessment package would include at least 2 loaded beam tests, a loaded column test and several unloaded indicative sections about 1 metre in length, comprising a mixture of beams and columns of different serial sizes.

N.B. A separate test programme and assessment is required for circular and rectangular hollow sections.

If the material is subjected to the ENV 13381-4 method of test and assessment, all sections sizes to be tested are contained within the test procedure.

SELECTION OF FIRE PROTECTION LEVELS

The structural strength of a steel beam or column is directly related to its mass and dimensions.

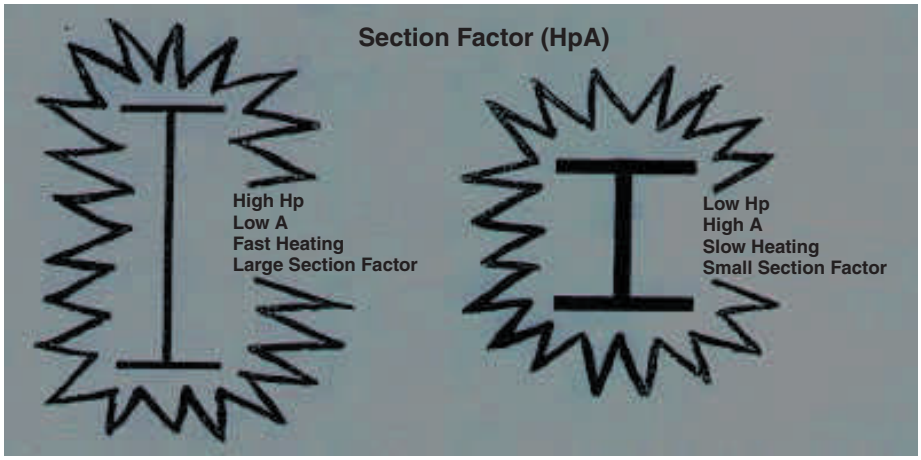
Lightweight sections heat up faster and require more fire protection than heavy sections.

The amount of fire protection required depends on the HpA (Section Factor) of the steel, which is the heated perimeter exposed to fire conditions divided by the cross sectional area of the steel.

Hp – The perimeter of section exposed to fire, i.e. heated perimeter (metres) and,

A – The cross-sectional area of the steel member (metres squared).

Section Factor = Hp/A (m-1)



Section Factor (HpA)

In the UK the major source of information on fire protection thickness is the ASFP (Association of Specialist Fire Protection) Yellow Book.

In calculating Hp/A values, the full cross-sectional area (A) is used irrespective of whether 1, 2, 3 or all 4 sides of the section are exposed.

Assessment of fire test data for entry into the Yellow Book follows agreed guidelines given by the ASFP, for example the maximum thickness of intumescent specified for application to beams cannot exceed that tested on a loaded beam by more than 10%. The reason for this is that reactive materials generally fail by detaching from the bottom flange of beams at high thickness, particularly when under flexural loading conditions.

The Yellow Book gives tabulated thickness data for assessed products in HpA ranges depending on the period of fire resistance specified.

The ASFP Technical Review Panel carries out the product assessments and peer reviews for the Yellow Book. The panel includes representatives from WFRC and BRE; two of the UK's UKAS approved test laboratories.

The Yellow Book is well established in the UK and is given recognition in Building Regulation's Approved Document B as a reliable source of information when specifying fire protection thickness.

WHAT DOES THE FUTURE HOLD FOR INTUMESCENT COATINGS?

In the next few years there will be a transition from BS476 part 21 testing to ENV 13381-4. This will be followed by ETA (European Technical Approval) leading to the CE Marking of Intumescent Coatings.

The latter is currently undergoing a great deal of discussion and is at present not deemed to be mandatory in the UK.

Improved coating technology, use of cellular beams and off-site application has seen a rapid growth in the use of intumescent coatings in recent years.

Further enhancements in rapid drying, durability and new, patented products will see this growth escalate further in the years to come.

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Warehouse Spr

THE MARKET FOR THE protection of large warehouses by sprinkler systems is booming. Today we see requirements or incentives to install fire sprinkler systems in large warehouses in the fire safety building codes of Denmark, Finland, France, Germany, The Netherlands, Norway and Spain. In fact sprinklers are becoming such a standard part of the fire safety design of new warehouses that some architects limit building heights and set the distance between bays to optimise the sprinkler system design. This article explains the background to this development and reviews the many types of warehouse sprinkler available to the sprinkler system designer.

By Alan Brinson

WHY IS EUROPE PROTECTING MORE WAREHOUSES WITH SPRINKLER SYSTEMS?

Modern warehouses are larger and less robust than in the past. Fire-fighters have found that all too often they are unable to save these warehouses from fire and in fact are not even able to enter them because of the risk of building collapse. They have therefore campaigned for building code changes to require or encourage the installation of fire sprinklers in large warehouses. The fire service has been supported in this campaign by an interpretative document on the Construction Products Directive from the European Commission, which states that in addition to other goals, fire safety "provisions aim at enabling rescue teams and fire-fighters to operate with a reasonable level of safety and leave the works with safety". Large warehouses need a sprinkler system to achieve this aim.

In a typical warehouse fire the relatively few occupants are healthy and able to leave the building quickly without assistance when the fire alarm sounds. This may not be the case in retail warehouses that sell furniture or home improvement products directly to the public and which include internal staircases. However in general the fire service arrives to find all the employees safely outside the building, but the flames already through the roof.

In a warehouse the closely piled stacks of goods, either on the floor or in racks, create flues and chimneys through which fire can propagate very rapidly. Fire tests show that fire can spread from ground level to a 13m high ceiling in as little as sixty seconds. It will be another ten or fifteen minutes before the first fire service water jet is applied to the fire. By then the fire can spread to cover a large part of the warehouse. Fire loads in a warehouse can be very high with paper, wood, flammable liquids and plastics common. Experts estimate the potential heat output to be as high as 85 MW. Modern, cost-optimised warehouses cannot withstand this heat for long and will collapse, trapping any fire-fighters inside. All the fire service can do is cool neighbouring buildings to prevent spread while the warehouse and its contents are totally destroyed.

In a warehouse the closely piled stacks of goods, either on the floor or in racks, create flues and chimneys through which fire can propagate very rapidly. Fire tests show that fire can spread from ground level to a 13m high ceiling in as little as sixty seconds.

This approach to fire safety is sometimes called the sacrificial building concept. The arguments in its favour are that life safety is assured through rapid egress and that the lack of any fire protection makes the building cheaper, so easing the legislative burden on the economy. This approach also emphasises that property protection is not the concern of the building code. The arguments against sacrificial buildings are that fire-fighters may be unnecessarily exposed to danger if they enter the building and the roof or racks collapse; and that neighbours are unnecessarily exposed to smoke, heat and pollution from the fire, as well as noise, smell and disruption during clean up for a long time afterwards. Insurers dispute the economic argument, since one total loss covers the cost of fire protection in many warehouses. In fact many insurers will not insure large warehouses unless they are protected by a sprinkler system. Furthermore the stated aims of building codes are changing to include environmental protection and even property protection. This also leads to calls for sprinklers.

inkler Systems

One way to limit the extent of the damage in a warehouse fire is to divide it into small fire compartments, using fire walls rated for extended exposure. The fire service can then cool these walls and prevent fire spread while the section within the fire wall burns out. The Dutch building code places the limit at 1000m^2; the French code places it at 3000m^2. For many warehouse operators a large number of firewalls would be impractical. For these operators the only other way to prevent rapid fire spread throughout the warehouse is to fit a fire sprinkler system, which responds to the fire while it is small and applies water well before the arrival of the fire service.

In recent years considerable sprinkler system research and development has focussed on warehouse protection and there are now many types of warehouse or storage sprinklers available to sprinkler system designers. The rest of this article will briefly review them.

The k-240 ESFR requires lower pressures than the k-200 ESFR and this gives the hydraulic designer more flexibility, in some cases allowing him to reduce a pipe diameter and so save on materials and installation costs.

DESIGN STANDARDS

When designing a sprinkler system for a warehouse the designer first needs to know the dimensions of the warehouse and whether the temperature can drop below 4°C. The next input is to assign a category to the stored goods. Section 6 and appendices A, B and C of EN 12845, the new European sprinkler system design standard, explain in some detail how to do this depending on what is stored and how it is stored. Higher categories require more water per square meter per minute and also a water supply that will last for longer.

Unfortunately EN 12845 does not include most of the recent innovations in storage sprinkler systems. These innovations reduce the cost of sprinkler systems so there is a strong incentive to use them. Designers then often turn to NFPA 13, which devotes 67 pages to storage and explains how to design systems with these new sprinklers. Insurers support the use of these new sprinklers and some are referenced in CEA 4001, the European insurance sprinkler design standard; all of them are in the US-based Factory Mutual design standard.

EARLY SUPPRESSION FAST RESPONSE SPRINKLERS

By responding quickly to a fire and releasing a lot of water onto it when the first sprinkler opens, it is possible to suppress a fire in an open rack of stored goods with the sprinklers installed only at the ceiling. Avoiding in-rack sprinklers reduces costs, encouraging owners to buy a system. It also allows the warehouse operator more flexibility if he should change the layout of the racks and removes the risk of accidental damage to sprinklers and consequent possible water discharge when pallets are moved within the racks. Since the ESFR concept was invented by Factory Mutual in the 1980s manufacturers have introduced ESFR sprinklers with increasing k-factors, or orifice sizes. This type of sprinkler now exists with k-factors of 160, 200, 240, 314 and 360.

The k-314 and k-360 ESFR sprinklers need less pressure at the sprinkler to release sufficient water to suppress a fire. They are designed to run without a pump, again reducing the cost of the system and strengthening the economic case for sprinklers in warehouses. These ESFR sprinklers are also approved to protect warehouse ceilings up to 13.7m in height, unlike other ESFR sprinklers which are approved to 12.2m.

The standard ESFR sprinkler, with the widest range of commodities or storage items which can be protected, is the k-200 ESFR. Recently the k-240 ESFR has been proven in fire testing to be able to protect the same commodities as the k-200 ESFR, with the exception of roll tissue, flammable liquids, aerosols and exposed expanded plastics. The k-240 ESFR requires lower pressures than the k-200 ESFR and this gives the hydraulic designer more flexibility, in some cases allowing him to reduce a pipe diameter and so save on materials and installation costs.

Upright ESFR sprinklers, of k-factor 200 and 240 were introduced a few years ago. The upright ESFR sprinklers are protected by the pipe from accidental damage by forklift operators. Since they can work around a pipe shadow, they are more forgiving of obstructions. But the main advantage of upright ESFR sprinklers is that they can get the deflector and thermal element closer to the warehouse ceiling. The distance of the deflector and thermal element from the ceiling is critical since it affects the speed of response of the sprinkler to the evolution of heat and

Warehouse Sprinkler Systems

Since propylene glycol is itself flammable its concentration is limited to 50% in the solution and the goods that can be protected are limited to NFPA Class II commodities or less.

its spread along the ceiling.

ESFR systems require fast response so it is not possible to use a dry pipe system, which may take 60 seconds to flow water from the heads after they open. However this year one manufacturer has introduced an ESFR system for refrigerated or cold storage warehouses. It is also suitable for unheated warehouses. The system uses propylene glycol to prevent water in the pipework from freezing. Since propylene glycol is itself flammable its concentration is limited to 50% in the solution and the goods that can be protected are limited to NFPA Class II commodities or less.

Although ESFR sprinklers offer cost savings and operational advantages, the designer and building operator should be aware that these sprinklers are very tightly specified when it comes to obstructions, permitted rack and storage layouts, building heights, and a number of other design criteria. Extensive fire testing has established these limits and shown that designs which do not respect them may totally fail to control a fire.

CONTROL MODE SPRINKLERS

Unlike ESFR sprinklers, which suppress or extinguish a warehouse fire, control mode sprinklers are designed to control the fire to a modest size but not to suppress or reduce it. Control mode sprinkler systems require additional sprinklers in the racks, usually making the system more expensive than an equivalent ESFR system. For this reason control mode sprinklers are used when the ESFR concept cannot be applied because the:

- building height is greater than 13.7m or the stored goods are above 12.2m
- roof slope is too steep for an ESFR design
- racks do not allow the passage of water from above
- goods are stored in high piles rather than racks
- temperature in the warehouse may fall below 4°C

Since control mode sprinklers control rather than suppress the fire, they require a water supply for 90 to 270 minutes, depending on the type of goods protected, compared to 60 minutes for an ESFR system. A larger water tank also increases system cost.

Lower storage categories can sometimes be protected k-80 standard orifice or k-115 large orifice standard spray sprinklers, if the hydraulics allow sufficient water pressure at the most remote sprinkler. Otherwise Extra Large Orifice ELO Sprinklers with a k-factor of 161 can be used. Extended coverage EC-25 sprinklers with a k-factor of 360 are listed to protect warehouses with a maximum area coverage per sprinkler of 18m^2, instead of the usual 9m^2 for storage sprinklers in high flow designs. This reduces piping and costs. In lower flow designs EPEC k-115 sprinklers can protect modest piles of stored goods at a spacing of 17.6m^2 instead of 12m^2. Where there is a problem of clearance above stored goods the CEA 4001 insurance design standard allows the use of flat spray sprinklers at 0.1m above the goods compared to 0.15m for standard spray sprinklers.

For storage areas classified by NFPA as extra hazard occupancies the required design density can be too high even for ELO and EC-25 sprinklers. These are applications for k-240 control mode sprinklers. K-240 sprinklers are also listed to protect racks up to 7.6m in height without the use of in-rack sprinklers.

Large drop k-161 sprinklers produce large drops which penetrate through the updraft of hot fire gases. They are therefore able to control rack storage fires of moderate hazard categories without the need for in-rack sprinklers and using lower flows than k-240 sprinklers.

Rack storage above 12.2m in height cannot be protected by ESFR systems and requires a control mode approach with in-rack sprinklers. These are standard orifice upright or pendent sprinklers with a water shield to prevent water from sprinklers above wetting the thermal element so that it does not respond to heat at that point in the racking.

Further Reading

There are many types of storage sprinkler available to the sprinkler system designer and it has not been possible to go into full details of the relative merits of each, nor to cover every aspect of sprinkler selection. For further reading consult EN 12845, CEA 4001 and NFPA 13, which show how to design warehouse sprinkler systems using the various options. More information is also available from sprinkler manufacturers and experienced contractors.

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** VdS approval is for K-22 only

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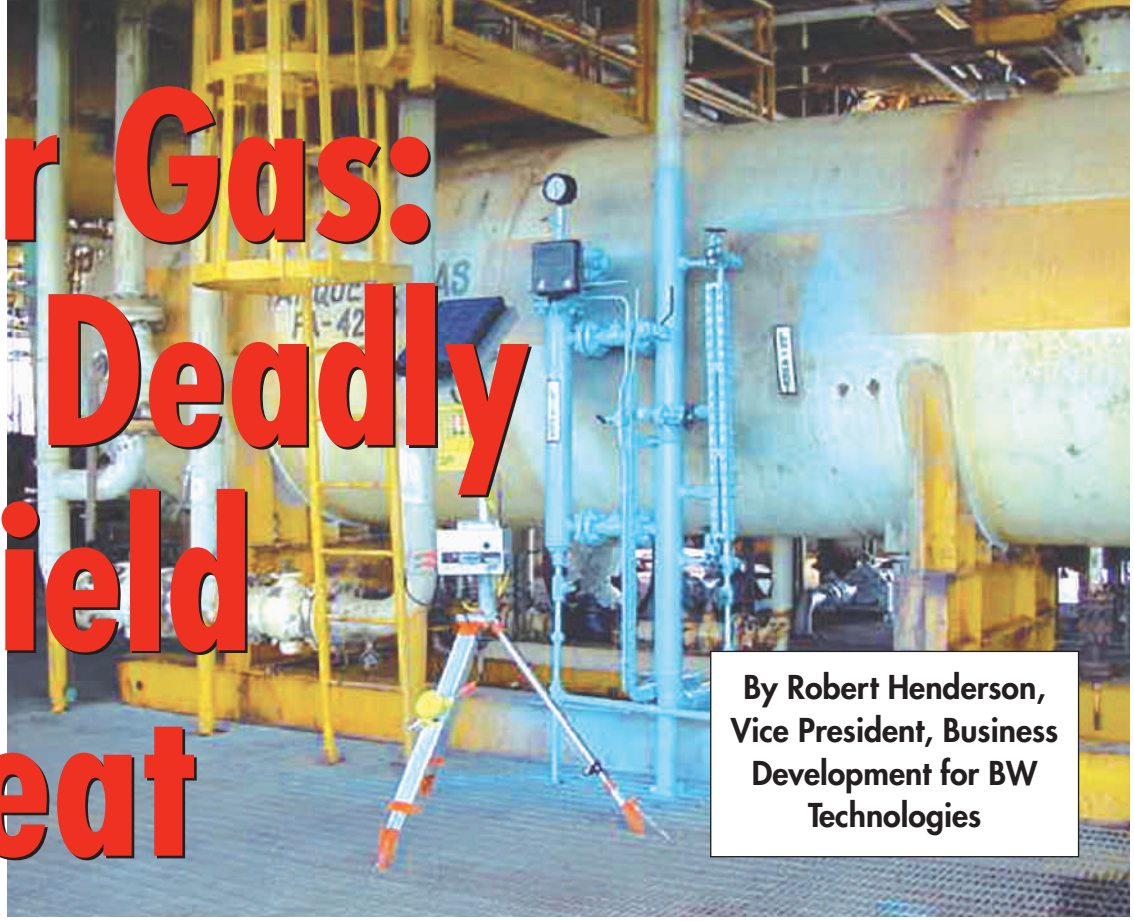
Sour Gas: The Deadly Oilfield Threat



By Robert Henderson, Vice President, Business Development for BW Technologies

Stand-alone gas detection systems can be equipped with radio transmitters that allow real-time monitoring results to be wirelessly transmitted to a base station or control room located kilometers away from the remotely located detectors

ON DECEMBER 23, 2003 a gas well blowout near the city of Chongqing in central China released a deadly mixture of natural gas and hydrogen sulfide. The toxic cloud of "sour gas" killed 243, caused the hospitalization and treatment of more than 9,000, and the evacuation of more than 60,000 nearby residents. Only two of those killed were gas field employees. The rest were residents of the surrounding area. Local emergency responders were completely unprepared for the accident.

The nighttime accident was China's worst oilfield disaster. The toxic cloud drifted across villages, killing people in their beds or in fields or roads as they tried to flee, leaving behind what authorities described as a 10-square mile "death-zone" downwind of the blowout.

A government report issued on January 2 concluded the drillers improperly dismantled anti-blowout equipment, misjudged the amount of gas in the well and failed to spot the blowout. The crew failed to immediately ignite the gas as it began to escape, which would have prevented the toxic cloud from spreading. Emergency workers couldn't approach the area until more than a day after the disaster because they lacked proper equipment to cope with the gas that continued to gush from the well. According to the Xinhua state news agency, the gas that continued to escape from the well was not deliberately ignited until 16-hours after the blowout, which was one of the reasons why the death toll from the accident surged from an initial eight victims to the final total of 243. Had local villagers been alerted through a system of sirens or public alarms, many more might have had time to successfully escape from the relatively slow moving cloud. When rescuers were finally able to enter the area, they found whole villages filled with bodies. Technicians finally plugged the leaking well on December 27, but the repercussions of the disaster will be felt for many years to come.

The oil company with responsibility for the site has already paid out over 33 million Yuan ($3.9 million USD) in compensation to the victims. According to Xinhua, compensation and insurance settlement costs may eventually exceed $48 million USD. The grief and suffering caused by the accident go beyond any efforts to quantify the damage.

Sour gas a deadly oilfield threat in developed nations also

The hazards of sour gas are by no means restricted to developing nations. In 1982, a sour gas well blew near the small town of Lodgepole in Southern Alberta, Canada and pumped sour gas into the air for 67 days. Two workers were killed and thousands of people downwind of the blowout were affected by the release. In Edmonton, over 75 miles away from the blowout, residents complained of nauseating odors, while closer to the well site, residents complained of a variety of increasingly serious symptoms, including headaches, eye irritation, nosebleeds (especially among children), as well as gastrointestinal and respiratory distress.

After a high-profile inquiry, Alberta officials concluded that the accident could probably have been avoided if the site operator had followed a policy of more cautious drilling in the critical zone, and if they had been "better

Sour Gas: The Deadly Oilfield Threat

prepared to deal with unexpected developments." It was fortunate that the blowout occurred in a remote location. Had the blowout occurred in a production area on the outskirts of Calgary, the largest city in the Province, the results could have been Catastrophic.

Today Alberta has some of the toughest H_2S health and safety regulations in the world. Provincial oil industry standards include a comprehensive system of monitoring and reporting procedures. In the case of "critical wells" that pose the greatest risks because of H_2S concentration and/or proximity to population centers, well operators must install redundant safety equipment, prepare detailed emergency-response plans, go door-to-door to warn residents of impending drilling and maintain minimum separation distances from homes and public buildings. Most importantly, in the event of a release, evacuation of the surrounding area becomes mandatory if the hydrogen sulfide concentration reaches 20 parts per million.

Toxic properties of H_2S

H_2S is produced by the action of anaerobic, sulfur fixing bacteria on materials that contain sulfur. It is a constituent of natural gas, petroleum, sulfur deposits, volcanic gases and sulfur springs. It is especially associated with oil production, refining activities, sewers, and many types of confined spaces. Tragically, hardly a week goes by that does not include a fatal accident somewhere in the world due to H_2S exposure.

At low concentrations, H_2S famously has an odor similar to rotten eggs. At higher concentrations, H_2S rapidly deadens the sense of smell. This rapid loss of the ability to smell H_2S leaves workers defenseless when they are dependent only on their human senses to take preventive measures or escape from affected areas.

At 750 ppm, inhalation can cause immediate collapse and unconsciousness. If exposure is very brief, for example, transitory envelopment by a passing gas cloud, the victim may awaken promptly and experience no adverse effects at all. In industries where hydrogen sulfide exposure is commonplace, for example oil field work, employees often refer to this phenomenon as "knockdown". A single breath at a concentration of 1,000 ppm results in immediate loss of consciousness, followed by cardiac arrest and death unless the unconscious individual is successfully revived. Many of the villagers killed in the China disaster died in their sleep, without even an opportunity to attempt to escape.

H_2S is soluble in water, explosive, (its LEL concentration is 4.3% volume), corrosive, heavier than air, and highly toxic. The China blowout occurred in a mountainous area crisscrossed by a number of downward sloping valleys. The valleys helped contain and funnel the heavier than air H_2S into nearby villages. The cloud persisted in localized areas until eventually neutralized by rain.

The corrosive properties of H_2S were especially apparent in newspaper photos of the victims of the China disaster. Many had eyes swollen shut, with faces horribly burned by exposure to the corrosive vapors. Many more have suffered permanent damage to delicate lung tissues exposed to the gas. For many survivors there will never be a full recovery.

Exposure limits for H_2S vary widely as a function of jurisdiction and workplace activity. The most widely recognized standards for H_2S reference an 8-hour TWA of 10 ppm or 20 ppm, and a 15-minute STEL of no more than 15 ppm. Concentrations above 100 ppm should be regarded as immediately dangerous to life and health.

Today's four-gas monitors for LEL/02/H_2S/CO measurement are rugged, affordable, and more compact than many single-sensor H_2S detectors sold in previous years

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• Zero maintenance personal H_2S detectors

Electrochemical H_2S sensors are not consumed or affected by exposure to gas. Because they require so little power during normal operation, it is possible to package the sensor, an LCD to display readings and messages, audible alarm buzzer, built-in vibrator, flashing LED alarm light, and battery capable of lasting a full two years, all into a gas detector so compact it can be clipped into a shirt pocket, or worn on a hard hat. Because the presence of H_2S is such a predictable hazard, at many oil production sites and refineries every worker is required to wear a personal gas detector for H_2S at all times while they are on site. Wearing an H_2S "Clip" or "Badge" at these facilities is as routine as wearing a hardhat and eye protection.

Zero-maintenance personal H_2S detectors are compact, weather resistant, and last up to two years without requiring battery replacement or calibration adjustment

Federal USA OSHA PEL

8-Hour TWA	*STEL*	*Acceptable Ceiling Concentration*	*Acceptable Maximum Peak Above Ceiling Concentration for an 8-Hour Shift*	
			Concentration	*Maximum Duration*
NA	*NA*	*20 ppm*	*50 ppm*	*10-minutes once only if no other measurable exposure occurs during shift*
NIOSH REL (used as exposure limit by many states)				
10 ppm	*15 ppm*	*NA*		
ACGIH® TLV® *10 ppm*	*15 ppm*	*NA*		

• Multi-sensor "four-gas" monitors

The potential presence of H_2S often goes hand-in-hand with the potential for combustible gas and vapor accumulations, as well as oxygen deficiency. Most leading manufacturers offer high quality, basic four-gas monitors priced between $695.00 to $995.00 USD. In many cases, the cost is only marginally more than the cost for a single-sensor H_2S detector. In addition, four-gas instrument designs have become so compact that they are actually smaller than the single-gas detectors marketed only a few years previously.

• Fixed gas detection systems

Fixed detection systems provide alarm notification on a 24-hour a day basis. Alarms are activated whenever conditions become unsafe, whether or not workers are currently present in the affected areas. In particular, fixed systems can be used to automatically notify local authorities in the event of an emergency. Even if workers in the area are incapacitated, or unable to communicate the existence of the alarm condition, a permanently installed system can sound the alarm to the proper authorities.

• Self-contained "Stand Alone" monitoring systems

Several manufacturers offer freestanding, solar-powered gas detection systems that can be permanently located in remote areas. "Stand Alone" systems can be equipped with radio transmitters that allow real-time monitoring results to be wirelessly transmitted to a base station or remote alarm located several kilometers away from the remotely located detectors. Because these systems can be powered by means of solar panels, they can easily be installed in areas that are too remote for traditional, line-powered gas detection systems. Because they can be mounted on portable tripods, it's easy to move the systems from one location to another as requirements change.

Gas detectors used to monitor for the presence of H_2S are increasingly compact, rugged, easy-to-use, and much less expensive than ever before. It may literally be less expensive to buy an entirely new instrument at today's prices, than to replace just the sensors in an older model. Given the prevalence, dangers and human costs associated with H_2S accidents, hydrogen sulfide detection should be an integral part of every oil industry worker safety program.

Robert Henderson is Vice President, Business Development for BW Technologies. Mr. Henderson has been a member of the American Industrial Hygiene Association since 1992. He is a current member of the AIHA Gas and Vapor Detection Systems Technical Committee. He is also a current member and past chair of the AIHA Confined Spaces Committee. He is also a past chair of the Instrument Products Group of the Industrial Safety Equipment Association.

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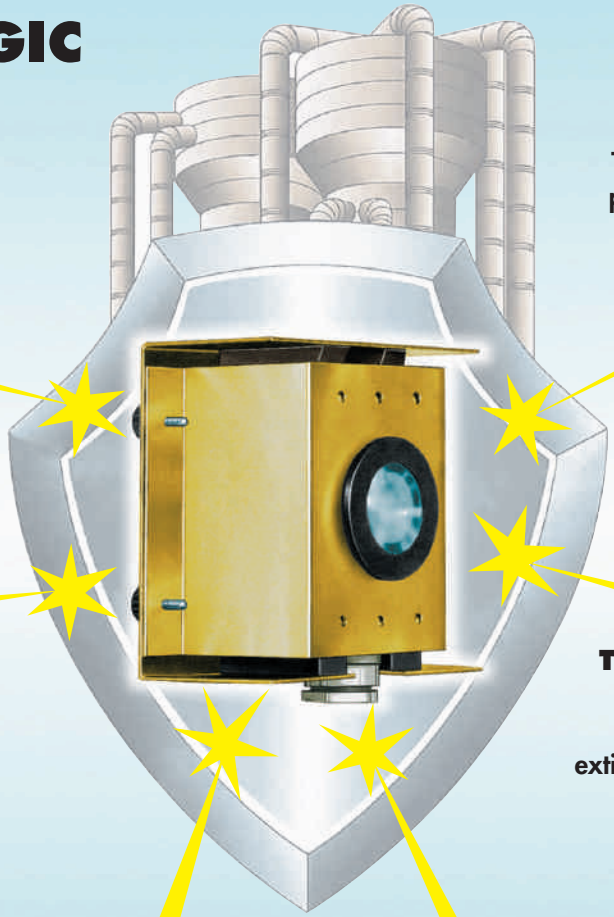

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Water Mist and Standards – A strong Dependence

By Matthias Ecke, General Manager, International Water Mist Association

Test arrangement for IMO machinery space test. The mock up simulates an engine onboard a ship.

Photo courtesy SINTEF

THE LAST 15 YEARS have been distinguished by significant advancement in the commercial application of water mist fire suppression technology throughout the world. Frequently cited and widely known, the Montreal Protocol leveled the way for water mist technology first as replacement for Halon. More than one decade of research and development on water mist systems has revealed a broad variety of applications where this technology can replace not only ozone depleting chemical agents, but it also represents a measure equivalent to standard sprinklers. The undisputed environmental advantages embodied by water mist systems combined with efficient fire fighting characteristics will certainly contribute to its continued success in the future. But what will be the driving force after a technology has demonstrated its ability to be used in an increasing number of fire protection applications? Obviously obliging standards. Or to ask the opposite way. What has been a barrier for water mist in the past? Obviously missing standards. This article will look at some regulations out there and current developments.

It is an unfortunate reality for the fire protection industry that very often disasters have to take place first before safety issues are taken into account with appropriate and necessary importance. Enough examples could be observed in the most recent past.

The Anna Amalia library in Weimar, a UNESCO heritage site, is certainly one of those incidents that caused some rethinking. Cultural heritage of the world, priceless and irreplaceable books, had been destroyed or damaged. After this accident on the beginning of September the authorities felt compelled to wake up in order to look at possible and effective alternatives to protect those treasures. Members of the International Water Mist Association in Germany reported a number of inquires by governmental authorities if water mist could be applied to protect these kinds of hazards. And it is able to as proven in a number of fire tests. However, the application would require at present significant efforts since a European or German standard is not yet available.

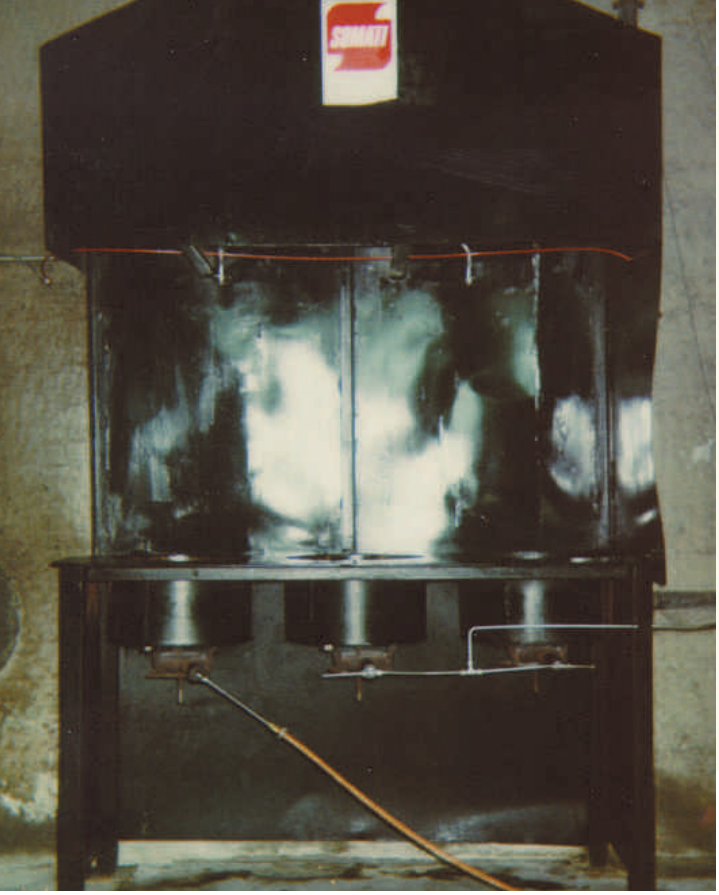
NFPA RECOGNISED THE NEED TO ACT EARLY

Although research and development on water mist technology was just taking off in the first half of the 90's, NFPA took on the responsibility at an early stage and established a standard which is today widely known as NFPA 750. The first edition of NFPA 750 was published in 1996, and was followed by a second one in 2000. The third and most recent edition was published in 2003.

Due to the lack of a solid understanding of the technology and sufficient experience, the NFPA could not provide simplified design rules or test scenarios in the middle of the 90's. On the contrary the guideline recommended testing the water mist system, preferably full scale, before applying to a certain application. The 2000 edition was rewritten in order to provide guidance how to develop test protocols for certain applications. However, NFPA 750 does not formulate general test scenarios for specific applications such as IMO does in its protocols.

Currently, one of the topics the NFPA committee is touching is obstructions. A proposal was made to include detailed criteria for locating water mist nozzles so that the spray distribution is not destroyed by obstructions. It is very likely that a modified rule of NFPA 13 which deals with placing nozzles near/above/below obstructions will be included in NFPA 750. Furthermore, the committee is dealing with the question of "minimum duration of protection". A proposal has been made to clearly state in the next issue that systems shall be able to guarantee protection for a total of 20 min, since the current paragraph 10.3.1. (2) led to some confusion about the minimum duration of protection.

The committee is preparing for a revised edition to be voted on by the NFPA general membership in autumn of 2005, and the 4th edition of NFPA 750 is expected to be published in early 2006.



Test arrangement for kitchen deep fat fryers. *Photo courtesy Fogtec*

UL 2167

Underwriters Laboratories certifies at present water mist nozzles, pumps and strainers, and UL offers certification in accordance with existing IMO regulations. The "UL Standard for Safety for Water Mist Nozzles for Fire Protection Service, UL 2167" is the corresponding document. The first edition was released in 2002 and was last revised at the beginning of 2004.

Besides the ordinary tests for nozzles like clogging, freezing and heat resistance tests, test procedures for shipboard applications are included which are well-known from IMO protocols such as MSC 668/728 and A.800(19) which were named earlier. However, there is again no paragraph which deals with test procedures for specific land-based applications.

FM 5560

FM has just put its draft standard 5560 on the table, and the new standard will be a big step forward. FM emphasizes that the standard is not only large in size (275 pages), but also in its potential impact on an industry that's still in its infancy. The standard will cover a long list of specific applications and occupancies being:

- Machinery spaces and special machinery spaces with volumes up to, and including, 80m^2 (oil pumps, tanks, fuel filters, generators, internal combustion units).
- Machinery spaces and special machinery spaces with volumes up to, and including, 260m^2.
- Machinery spaces and special machinery spaces with volumes exceeding 260m^2.
- Combustion turbine enclosure with volumes up to, and including, 80m^2 as well as up to, and including, 260m^2, and exceeding 260m^2.
- Light hazard occupancies (nonstorage and nonmanufacturing areas such as hotels, meeting rooms, hotels).
- Wet benches and other similar processing equipment (spin-rinse dryers, alcohol-vapor dryers).
- Local application occupancies.
- Industrial oil cookers.
- Other occupancies.

Therefore, the standard covers a big variety of applications, including a part "other occupancies". Manufacturers interested in pursuing water mist protection of other occupancies are here invited to make requests, respectively. FM 5560 will be the most comprehensive source of water mist test requirements for land-based applications. Important to manufacturers is the fact that this standard will considerably reduce the overall cost for testing. The International Organization for Standardization has promised to consider the FM document. Hence, the FM guideline might be used springboard for international water mist standards for land-based applications.

WHAT IS HAPPENING IN EUROPE?

Although the majority water mist applications can be found in Europe, a European standard for water mist systems is not released yet. The European Standard Organization has assigned the Work Group 5 of the technical committee CEN/TC 191 "Fixed firefighting systems" in 1998/1999 to develop a standard for "Watermist systems – design and installation". This work has reached the stage of a proposed European Standard, Draft prEN 14972, sent out for public enquiry in 2004.

The content of the draft standard embodies similarities with other standards such as NFPA 750 in terms of terms and definitions, nozzle tests and so on. However, CEN goes one step further and recommends test procedures for specific applications such as:

- Test procedure for flammable liquids.
- Test procedure for volume protection compartment systems.
- Test procedure for cable tunnels.
- Test procedure for office occupancies of ordinary hazard group 1.

Although CEN formulates these test procedures, the actual testing must be carried out at a recognized fire testing laboratory. A system that has passed a test under certain circumstances (compartment size) can be applied to that hazard in reality. However, if enclosure characteristics change, that is a bigger compartment has to be protected, additional testing by underlying the same test method has to be carried out. Based on today's knowledge a standardized test method for a certain application which can be used for all possible variations in terms of compartment size, ventilation, and so on is not seizable yet. Further testing and scientific work has to prove for example if scaling rules can be established that allow the application of a system to different conditions as tested by providing the same safety level.

CONCLUSION

The ongoing success of water mist systems will strongly depend on reliable codes and standards. IMO has been the first driving force which developed standards for the use of water mist on ships. NFPA in the first place, UL, FM and CEN have developed guidelines for land-based applications over the last years.

Other bodies such as ISO, who were not named particularly in this article, have developed standards as well. Due to the lack of a solid understanding of the technology in the early years, organizations were careful in formulating specific test procedures for certain land-based applications. However, the need for testing was emphasized, preferably on full scale basis, before applying the technology to a specific application.

Now one can notice by studying the draft European standard as well as the draft FM standard 5560, both coming into force in the near future, that test procedures were included in those guidelines. A significant gain in knowledge over the last decade, due to thousands of fire tests and lab work, enabled manufacturers and experts to design test procedures for land-based applications. However, the existing knowledge does not allow the development of standardized test protocols for specific applications which are valid for different system variations particularly in terms of compartment size. There is still the need to carry out intensive testing and further scientific work has to take place in order to answer, for example, questions concerning scaling rules.

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A guide to the sele in accordance with "Fire detection and fire alar

Pic courtesy of Cavicel Srl

Part 1: Code of practice for system design, installation, commissioning and maintenance

By Marcelo Celantano of Cavicel Srl

THE NEW STANDARD BS 5839-1:2002 supersedes the previous 1988 edition, which has been withdrawn on 15 July 2003.

Projects designed to BS 5839-1:1988 may, by agreement between contractual parties, be completed to that edition.

MAIN CHANGES

- Two different levels of resistance of cables to damage during the course of a fire are recognized, and recommendations for application of each type are provided.
- The use of fire resisting cables is now recommended for all manual call points and automatic fire detector circuits. The use of fire resisting cable is also recommended for all mains power supply circuits.
- Recommendations for networked systems, particularly in respect of cable types, are included.
- New guidance of segregation.
- New guidance on cable fixing and installation.
- Restriction on use of multicore cables.

USE OF FIRE RESISTANT CABLES

This standard makes recommendations for two levels of fire resistance of cable systems, termed "**standard**" and "**enhanced**", according to the type of building and fire alarm system installed:

- the use of cables with "standard" fire resistance is recommended for general use;
- the use of cables with "enhanced" fire resistance is recommended for systems, in particular building types, in which cables might need to operate correctly during a fire for periods in excess of those normally required for single phase evacuation of a building. Examples are unsprinklered high rise buildings with phased evacuation arrangements and premises of such a nature or size that areas remote from the fire could continue to be occupied for a prolonged duration during a fire that might then damage cables serving parts of the fire alarm system in occupied areas.

The distinction between two levels of performance is, therefore, made in this standard to enable designers and specifiers to specify "enhanced" performance cables in situations in which it is considered that a higher level of fire resistance is desired.

TYPES OF FIRE RESISTANT CABLES

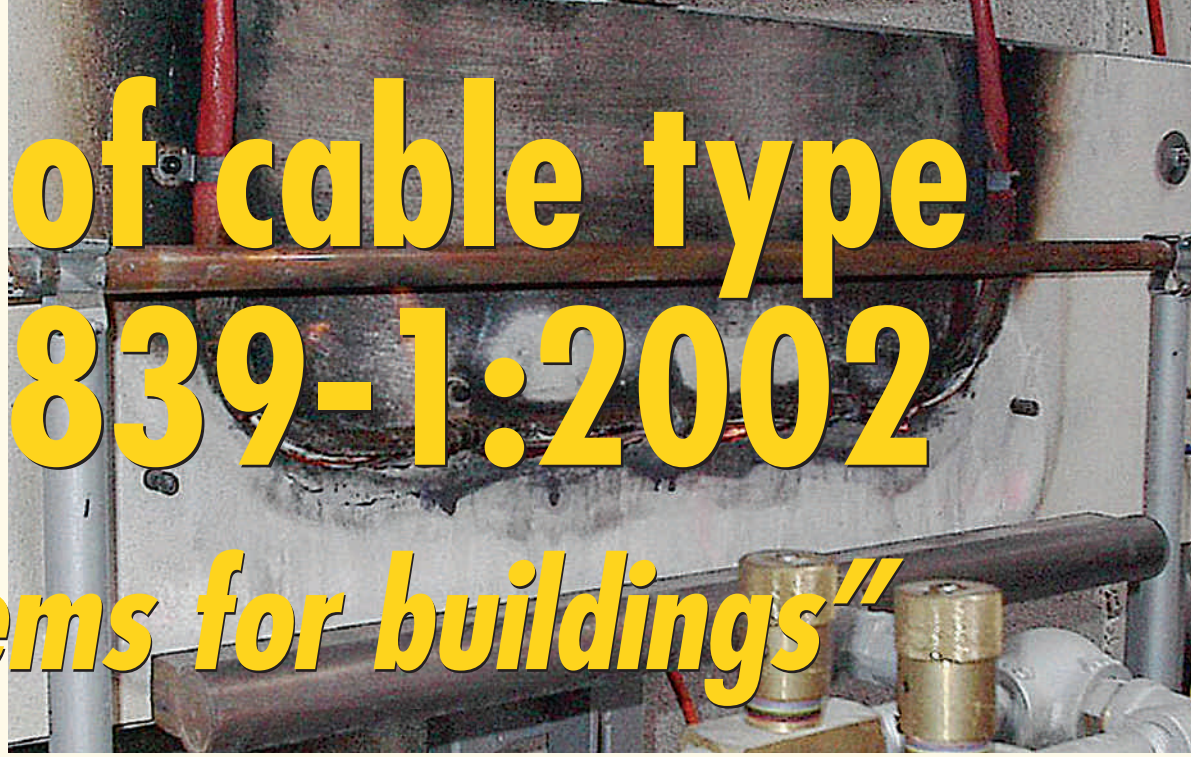
The Code specifically recommends only three types of cables:

- mineral insulated copper sheathed cables conforming to *BS EN 60702-1: 2002, IEC 60702-1: 2002* – Mineral insulated cables and their terminations with a rated voltage not exceeding 750 V;
- cables conforming to *BS7629-1/2: 1997* – Specification for 300/500 V fire resistant electric cables having low emission of smoke and corrosive gases when affected by fire;
- armoured fire-resistant cables conforming to *BS 7846: 2000* – Electric cables. 600/1000 V armoured fire-resistant cables having thermosetting insulation and low emission of smoke and corrosive gases when affected by fire.

However, the Code also accepts the use of cables rated at, at least, 300/500V that provide the same degree of safety to that afforded by compli-

ction of cable type BS 5839-1:2002

m systems for buildings"



Pic courtesy of Cavicel Srl

ance with BS 7629, so precluding any obstacle to the use of new forms of cable.

NEW TEST REQUIREMENTS FOR FIRE RESISTANT CABLES

Previous requirements for fire resistant cables were based on tests included in *BS 6387*.

Tests specified in BS 6387 include three different tests, performed on three different samples:

- test for resistance to *fire alone* (Cat. A, B, C, S)
- test for resistance to *fire and water* (reflecting the fact that, during a fire, water will be discharged onto the fire from extinguisher or sprinklers) (Cat. W)
- test for resistance to *fire and mechanical shock* (reflecting the fact that, during a fire, objects or materials may fall) (Cat. X, Y, Z)

With The tests specified in the new standards the effects of fire, water and shocks are now simultaneously applied to the same sample.

The tests are now referred to the following standards:

for standard cable:

EN 50200:2000 – PH 30 (830°C, 30 min fire and shock)

BS 8434-1 (830°C, 15 min fire and shocks and 15 min fire, water and shock)

for enhanced cable:

EN 50200:2000 – PH 120 (830°C, 120 min fire and shock)

BS 8434-2 (930°C, 60 min fire and shocks and 60 min fire, water and shock)

APPLICATIONS FOR "STANDARD" OR "ENHANCED" CABLES

BS introduces new requirements for cables and identifies two levels of requirements depending on the application: standard cables are recommended for the vast majority of applications, while enhanced cables being recommended for certain specific building applications.

For many applications "standard" cables are the proper solution for fire alarm systems.

Enhanced cables are anyway recommended in the following cases:

1. in unsprinklered buildings (or parts of buildings) in which the fire strategy involves evacuation of occupants in four or more phases;
2. in unsprinklered buildings of greater than 30 m in height;
3. in unsprinklered premises and sites in which a fire in one area could affect cables of critical signal paths associated with areas remote from the fire, in which it is envisaged people will remain in occupation during the course of the fire: examples may be large hospitals with central control equipment and progressive horizontal evacuation arrangements, and certain large industrial sites;
4. in any other buildings in which the designer, specifier or regulatory authority, on the basis of a fire risk assessment that takes fire engineering considerations into account, considers that the use of enhanced fire resisting cables is necessary.

CABLE FIXING AND INSTALLATION

Cables should be installed without external joints wherever practicable.

It is not good practice to joint fire resistant cables.

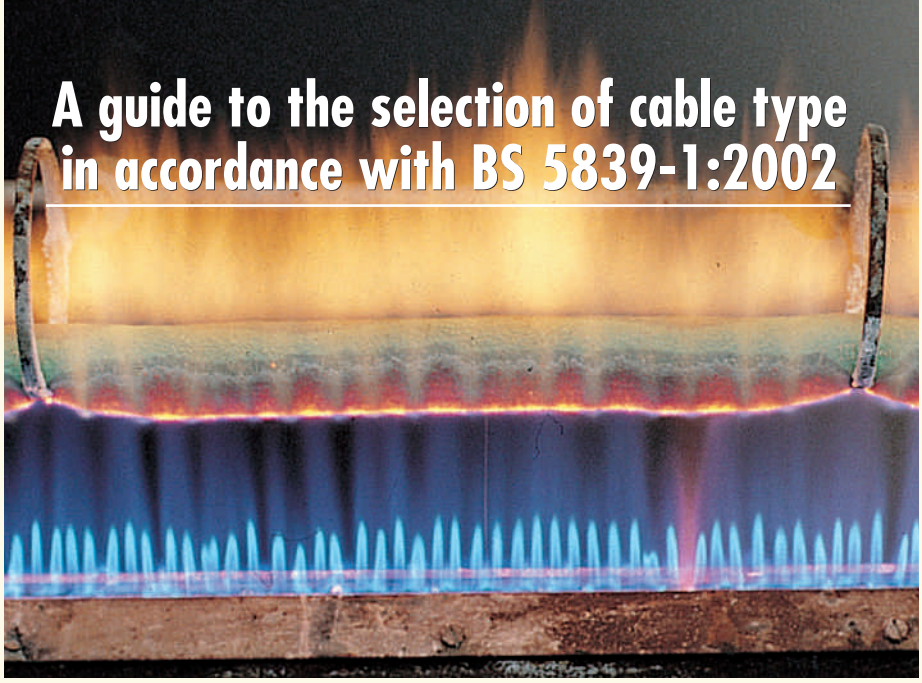
If jointing is unavoidable then a fire resistant box containing ceramic connectors must be used.

Methods of cable support should be such that circuit integrity will not be reduced below that afforded by the cable used, and should withstand a similar temperature and duration to that of the cable, while maintaining adequate support.

This recommendation precludes the use of plastic cable clips, cable ties or trunking, where these products are the sole means of cable support.

All joints, other than those within system components, should be

A guide to the selection of cable type in accordance with BS 5839-1:2002



Pic courtesy of Cavicel Srl

enclosed within junction boxes, labelled with the words "FIRE ALARM" to avoid confusion with other services.

Cables can be installed directly in a wall or under plaster.

All conductors should have a cross-sectional area of at least 1 sq mm.

SEGREGATION OF FIRE ALARM CABLES

The circuits of fire alarm systems need to be segregated from the cables of other circuits to minimize any potential for other circuits to cause malfunction of the fire alarm system arising from:

Pic courtesy of Cavicel Srl

- breakdown of cable insulation of other circuits and/or fire alarm circuits;
- a fire caused by a fault on another circuit;
- electromagnetic interference to any fire alarm circuit as a result of the proximity of another circuit;
- damage resulting from the need for other circuits to be installed in, or removed from, ducts or trunking containing a fire alarm circuit.

In order to facilitate identification of fire alarm circuits cables should preferably be red in colour, unless another form of colour coding is appropriate.

If cables have to be installed in the same conduits with other cables a compartment of the trunking, separated from other compartments by a strong, rigid and continuous partition, should be reserved solely for fire alarm cables.

The use of cable to BS 7629, due to screen layer, is considered to provide adeguate segregation for tray or clipped installation.

MECHANICAL PROTECTION

The standard recognises that mechanical protection has to be assured in any areas in which mechanical attack is likely, unless cables to BS 7846 (mineral insulated) or BS EN 60702-1 (steel wire armoured), or any other armoured constructions are used.

Protection may be provided by laying cable on tray, protecting it by burying in the structure of the building, or by installation in conduit, ducting or trunking. Where particularly arduous conditions might be experienced (such as impact by forklift trucks or goods trolleys), additional, robust protection should be given to all cables by burying the cable in the structure of the building or installation in metal conduit or trunking.

In "relatively benign environments" (offices, shops, and similar premises) in which cable is clipped directly on robust construction, it is possible to install the so-called "soft-skinned" cables without additional mechanical protection.

RESTRICTION ON USE OF MULTICORE CABLES

In order to assure system integrity, a fault on one cable shall not compromise another circuit.

This limits the use of multicore cable for certain applications in which the failure of more than one circuit as a result of a single fault is precluded by the recommendation of this standard.

For example, two circuits intended to satisfy these recommendations should not be served by a common four core cable, as this would not adequately protect against the simultaneous loss of both circuits.

OTHER INTERCONNECTIONS (FIBRE OPTICS)

The components of most fire alarm systems are connected by cables and wiring, but it is possible to connect them by other means, such as radio or fibre optics.

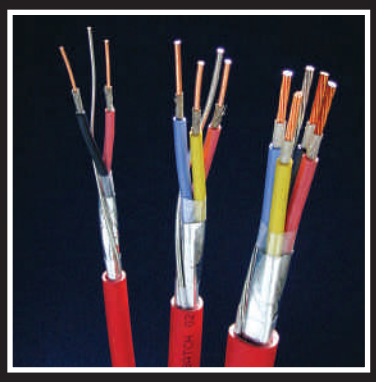
Where fibre optics connections are used, they need to provide at least equivalent integrity and reliability to other cables that are recommended for the same purpose.

It is essential that all interconnections operate correctly at the time of a fire.

APPROVAL AND CERTIFICATION

When quality and performance are so critical, it is important that the materials and supliers are selected very carefully. This is why this standard suggests to choose good quality components that satisfy relevant standards and that have a third-party certificatioin.

In cable industries LPCB is the most recognized body for testing and approval of fire resistant cables.



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BS 5839-1: 2002
BS 8434-1-2: 2003
EN 50200
BS 7629
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BS 6425
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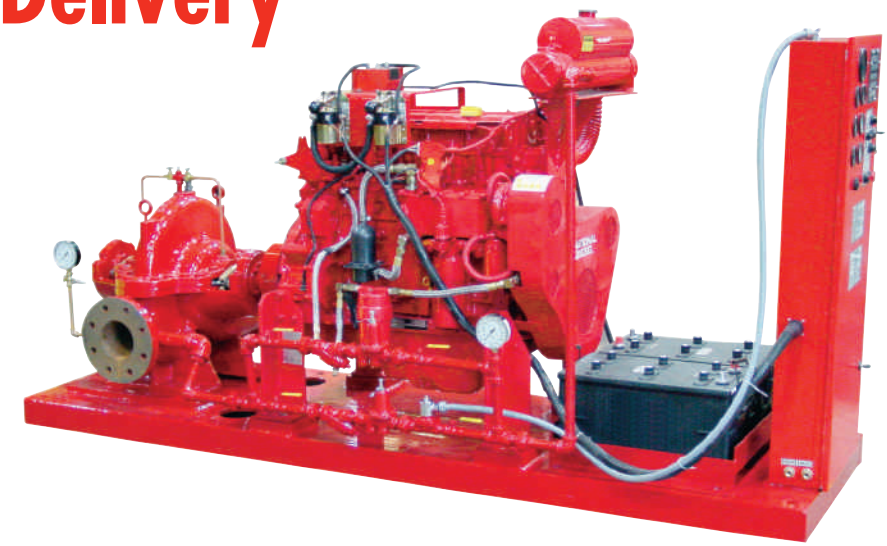

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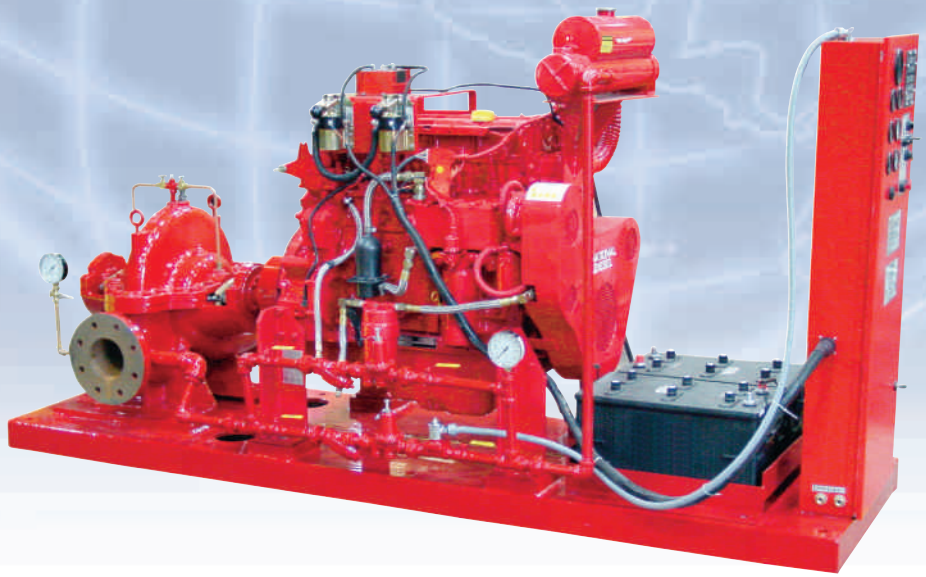

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What's new in UK Fire Protection?

A fully risk-assessed regime for commercial buildings

By Graham Ellicott, Chief Executive, Association for Specialist Fire Protection (ASFP)

SO WHAT'S NEW IN UK FIRE? Most people would answer the re-organisation of the Fire and Rescue Services and whilst this is certainly high on the agenda, there are other major impending changes of which all professionally qualified engineers and building owners should be aware. In 2005 it is highly likely that the Regulatory Reform (Fire Safety) Order (RRO) will become law and this will change the way that conscientious engineers and managers look at the fire safety of buildings.

Firstly though a little background. To start with what are the aims of the RRO? In the words of the explanatory notes to the order itself:

'*The aim of the proposed reform is to reduce burdens on business that are caused by the existence of multiple, overlapping general fire safety regimes – and consequently overlap of the responsibilities of enforcing authorities. The proposed order would consolidate and rationalise much existing fire safety legislation (currently scattered across a large number of statutes and secondary legislation) into one order. In doing so it would reduce the number of enforcing authorities dealing with general fire safety matters. The reform would maintain and enhance the protection afforded to users of premises (and others who might be affected by a fire on the premises) by the existing legislation.*'

In layman's terms, the RRO is intended to simplify fire legislation and in particular to remove the overlap between the Fire Precautions Act 1971 and the Fire Precautions (Workplace) Regulations 1997. The central aim of the Fire Precautions Act 1971 is to ensure that, in the event of a fire, the occupants can evacuate the premises safely, while the Fire Precautions (Workplace) Regulations 1997 requires employers to identify risks and take steps to remove or reduce them.

In particular the objectives of the RRO are to:

- Create a single regime, which can be better understood and administered by both businesses and the relevant authorities
- To create a regime clearly based on risk assessment and fire prevention and mitigation measures
- To increase compliance
- To focus resources for fire prevention on those premises which present the greatest risk
- To ensure that fire safety facilities and equipment (including fire alarms) are well maintained.

For the building owner the major change under the new regime will be the removal of Fire Certificates and the Office of the Deputy Prime Minister (ODPM) estimates that this alone will save business £1.65m per year. In the opinion of ODPM, the new regime will promote greater compliance and more focus on fire prevention in high-risk properties. Number crunching indicates that a reduction in the number of fires in England and Wales of 5%, 10% and 15% would achieve annual savings of £39m, £79m and £118m respectively, not to mention the unquantifiable saving in terms of the human costs of fire outlined above.

The RRO places the onus of the fire safety in buildings on the shoulders of

For the building owner the major change under the new regime will be the removal of Fire Certificates and the Office of the Deputy Prime Minister (ODPM) estimates that this alone will save business £1.65m per year.

What's new in U

To satisfy the requirements of the RRO, the responsible person will be required to ensure that an assessment of the risk of, and from, fire is undertaken for the place and activity.

the Responsible Person. This person is:

- the employer (where there is one)
- the person in control of the premises in connection with the carrying on of a trade, business or other undertaking (for profit or not)
- the owner
- any other person who to any extent exercises control over the place.

To satisfy the requirements of the RRO, the responsible person will be required to ensure that an assessment of the risk of, and from, fire is undertaken for the place and activity. Identified hazards will be removed, or reduced so far as is reasonable and special consideration will be given to the risks posed by the presence of dangerous chemicals, or substances and the risks that these pose in case of fire. Special consideration will also be given to any group of persons who may be especially at risk in case of fire, whether due to their location or any other factor.

All precautions provided will be subject to maintenance and will be installed and maintained by a 'Competent Person'. Under the RRO such a person is to be regarded as competent where he/she has sufficient training, experience or knowledge and other qualities to enable him/her properly to assist in undertaking the preventive and protective measures. For commercial buildings the main enforcing body will be the local fire and rescue authority. If the RRO runs reasonably smoothly through the political scrutiny processes, then it is likely to become law around the summertime of 2005.

A number of Guidance Documents that will be building type specific will support the RRO and these will give help to the Responsible Person with regard to how risk assessments should be carried out for their particular type and size of building. Trade Associations and in particular, the Association for Specialist Fire Protection (ASFP), have a role to play in supporting the RRO with the main emphasis being upon education via seminars and publications. Perhaps the most logical ASFP publication to start with is 'Ensuring Best Practice for Passive Fire

K Fire Protection?

Protection in Buildings'. This was developed using partial funding from the Department of Trade and Industry and contains guidance on all aspects of the design, installation and maintenance of passive fire protection. Any readers that would like a free hard copy of this document should call the ASFP on 01252 739142 referencing this article.

Other documents from the ASFP that will be of help those involved with fire safety in the UK's buildings include the 'Yellow Book' (also known as 'Fire Protection for Structural Steel in Buildings') and the 'Red Book' (also known as 'Fire Stopping and Penetration Seals for the Construction Industry'). All ASFP documents are available as free downloads from its website, www.asfp.org.uk

The ASFP is pleased to see the mention of the use of Competent Persons and we regard this as a natural follow on from the following statement in Approved Document B Fire Safety to the Building Regulations for England and Wales:

> *'Since the fire performance of a product, component or structure is dependent upon satisfactory site installation and maintenance, independent schemes of certification and registration of installers and maintenance firms of such will provide confidence in the appropriate standard of workmanship being provided.'*

All contracting members of the ASFP are (or are required to become) members of a third party accreditation scheme and the use of these companies will give the Responsible Person a meaningful certificate of conformance upon the completion of any work.

By the end of 2004 the move towards a fully 'risk assessed regime' will be that much closer. For the Responsible Person to effectively discharge their duties they will need all the help they can get and the use of guidance from trade associations should form part of this package of assistance.

> *If the RRO runs reasonably smoothly through the political scrutiny processes, then it is likely to become law around the summertime of 2005.*

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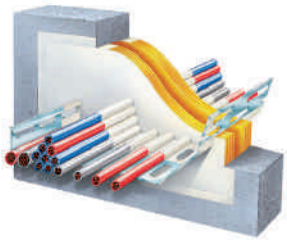

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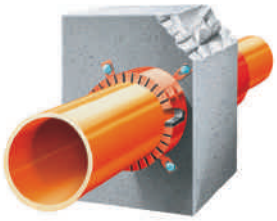

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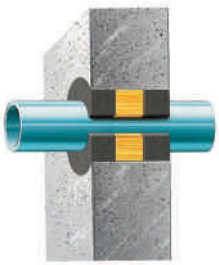

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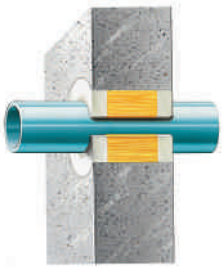

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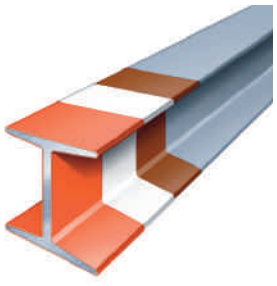

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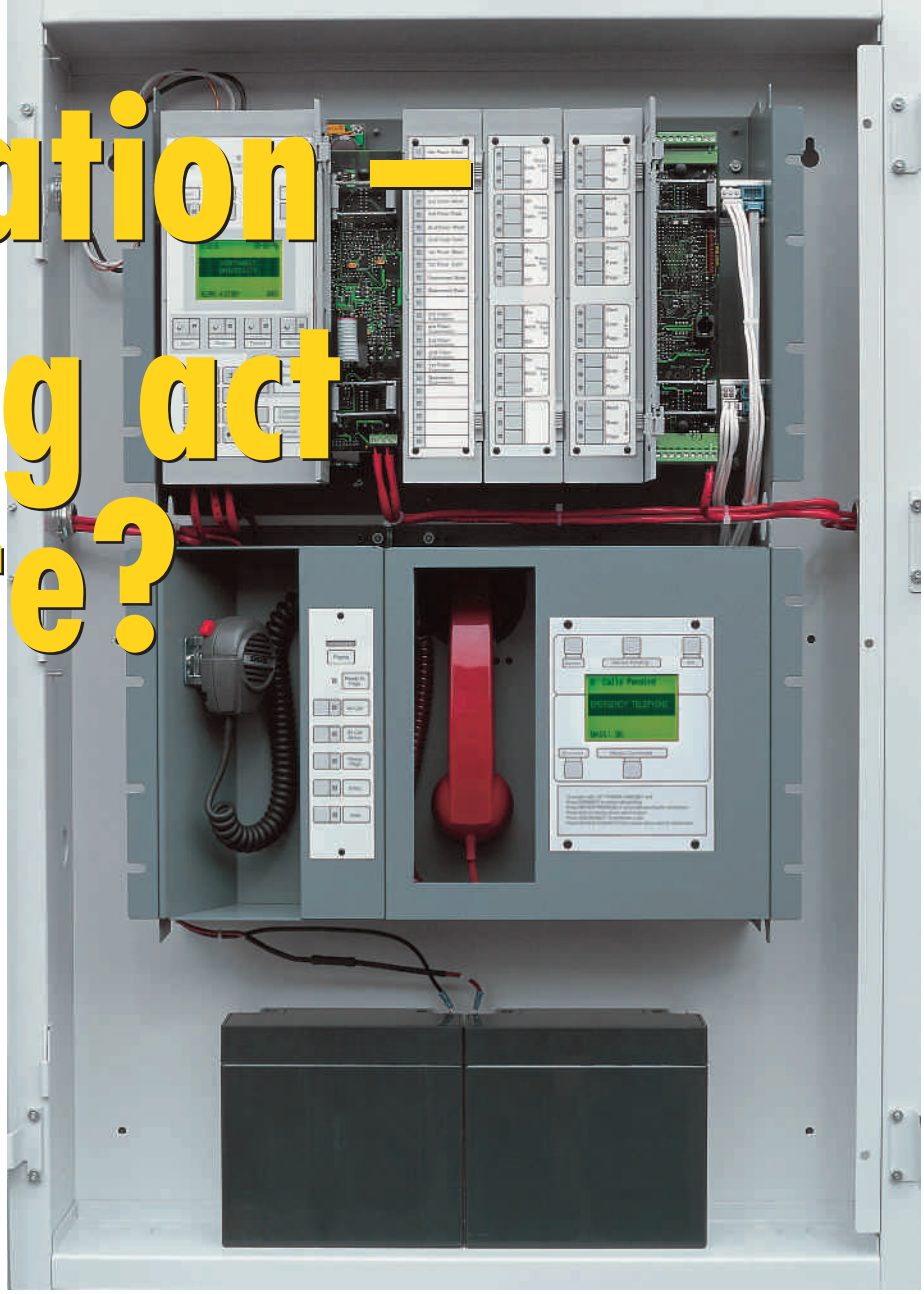
Integration – juggling act or more?

By Okay Barutcu, Regional Director – Europe & South Africa, Edwards International Ltd. Based in Arundel, UK



Pic courtesy of EST International

INTERFACED SYSTEMS CREATE THE illusion of system integration. But can they really deliver on the promise of enhanced performance and increased efficiency?

Life safety used to mean the protection of buildings and occupants against the threat of fire. This is no longer strictly the case. In the span of just a few short decades our industry has undergone quantum leaps from relay logic technology, to microprocessor-based systems; from master/slave configurations, to peer-to-peer networks; from ringing bells, to integrated voice audio evacuation.

Then we began to see what was called interfacing – really a method of joining two or more building control systems so they could be monitored and sometimes controlled from a single point. So-called integrated fire, voice alarm, security, access control, and CCTV systems are essentially separate systems combined by means of interfaces that create the illusion of integration. These systems required separate field wiring, separate control panels, separate power supplies and separate programming for each function. They typically consist of layers of control responsibility built upon a patchwork of relay interfaces, communication and protocol converters – often created for each site. This results in a workable solution – as long as nothing goes wrong.

But as with any juggling act, the more balls that must be kept in the air, the more chance there is that something gets dropped. And when that happens, all those gateways and protocols soon become minefields that no one wants to take ownership of. The integrator frequently points to the equipment manufacturers, while the manufacturers point to each other and the integrator. The owner or the facility manager of course, is the one who picks up the cost of getting the balls up in the air again, as well as the time and effort involved in figuring out who's ball was dropped in the first place.

In reality interfaced systems are a rather bumpy short-cut to what the owner really wants: True Integration, one system, one point of responsibility . . . a solution that does not increase the overhead of sophisticated technology, but rather one that streamlines it . . . much more effective than interfaced systems, much easier to implement and maintain. This may seem a difficult goal, but is one that is not entirely impossible. Let's look at the possibilities.

TRUE INTEGRATION WITHOUT COMPROMISE IS POSSIBLE

Edwards Systems Technology, the life safety systems innovator, has developed a method by which fire detection, voice alarm, fireman's phones, access control, and security can all coexist on a common platform.

This new generation of system does not merely interconnect separate building functions, it merges these functions on a common platform. This renders the whole notion of hardwired

Integration – juggling act or more?

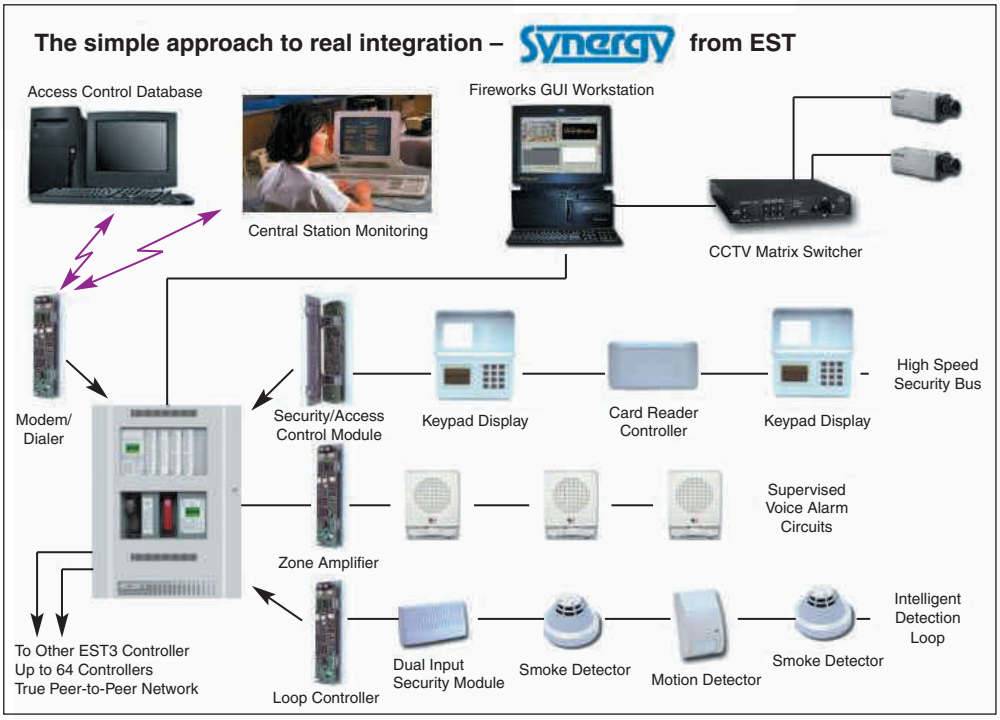
interfaces, gateways and protocol converters irrelevant. Why? Because data concerning all the functions flows across the same network and subsystems interact seamlessly. There is no need to look for a common means of communication because they share the same nervous system.

Alarms, interactions and overrides are prioritized automatically by the system to avoid any confusion or delays in responding to critical events. When all components of the system are tested and comply with the most stringent of the codes applicable to the various subsystems, then integrity, reliability and survivability of the life system will not be compromised either.

Look at it in a very simplistic way: most people do not have a series of networked desktop computers, one for each individual task they want to accomplish. If you want a webcam, you plug it into the same PC that supports your scanner and printer and CD writer. Your PC supports these different functions because the architecture allows it and because it is impractical to do it any other way.

THE WHOLE IS GREATER THAN THE SUM OF ITS PARTS

The benefit of this method is that it achieves a level of synergy never before



Learning to use and maintain a single system is easier than learning multiple products, so the owner saves in training costs.

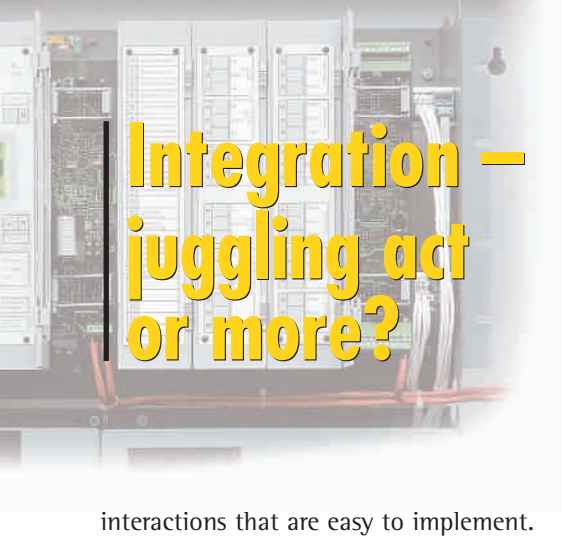
accomplished in the building control field. Imagine the advantages of control panels, enclosures, power supplies and backup batteries, all dedicated not to just one system function, but shared among several. Consider the benefits of common communication circuits and the cost savings in wire and installation alone.

One unified system makes everything simpler. With such a system you could accomplish tasks with simple software commands instead of sophisticated protocol converters, interposing relays, conduit, and wired links. Fire loops, voice alarm amplifiers, intelligent security and access control circuits, and fire phones all work as integral parts of the same panel. Each panel can be tailored to the needs of the area it serves and several panels can be networked to cover larger areas/buildings or campus type facilities.

So who benefits from this synergy? Topping the list are building owners & operators and design professionals. Lower equipment and installation costs obviously bring the initial cost down. There is less labour required, and less system programming and troubleshooting. It is not necessary to co-ordinate two or more parties to ensure the system is communicating and responding properly as with interfaced systems. But there are more subtle savings that come into play because you have a more efficient system overall. Your access card could be programmed to arm the security partitions, turn off the lights, change the sensitivity of the smoke detectors in these areas to "Night Mode" and announce over the voice alarm system that the system will automatically arm in ten minutes. Or the system can automatically unlock exit doors on the relevant escape routes during a fire, switch off air handling units, use the multiplex voice alarm system to alert & evacuate the building and bring up a live video feed from the effected area onto the system operator's PC screen. All can be achieved without installing a single additional component.

Learning to use and maintain a single system is easier than learning multiple products, so the owner saves in training costs. New employees are up and running on the system quicker, thanks to a shorter learning curve. Should problems develop beyond the owner's capability, there is only a single trouble call to make – no shared responsibility or finger-pointing. Trouble shooting is easier, system down time shorter and less spare parts are needed.

Design professionals reap significant rewards by specifying a one-system, multiple-function platform. The synergy of a unified system offers an easy-to-specify project that allows a good deal more creativity and functionality. Designers are no longer constrained by the hardware and interface limitations of individual systems. They are now free to create new system



Integration – juggling act or more?

interactions that are easy to implement. Coordination among individual functions is far easier, thanks to a single point of responsibility that replaces multiple vendors. This method also offers flexible migration paths and system scalability, all of which can save time and money during the life cycle of the system.

WHAT ABOUT LIFE SAFETY CODES?

The requirement for 3rd party certification of products has established life safety as among the most stringently regulated and most closely scrutinized industries in the world, and rightly so. Requirements in most countries today either preclude or do not recommend the mixing of equipment used for other building functions with life safety equipment. Why? Fire alarm equipment must meet survivability and performance standards that are far more stringent than any other system components and devices. Because of this, interfacing is a much easier solution for most manufacturers and system integrators. They take the easy way out by simply declaring that true integration cannot be achieved and is even dangerous.

But what if fire alarm performance benchmarks could be applied to security and access control equipment without compromising the integrity of the fire alarm system? What if fire alarm, security, and access control equipment could co-exist on one common platform that met the requirements? What if security and access control equipment could be approved to fire alarm standards? What if a manufacturer turned this theory into practice?

Like with all new technologies, it takes some time before the standards and approvals agencies catch up with the advances in technology. This has always been the case in our industry. Some more recent examples are; multi-criteria detectors, voice alarm systems, peer-to-peer networks and fire phones. Some of these standards are still under development while many customers already enjoy the benefits of these innovations to make their homes and workplaces much safer environments. Integration is certainly one of these still evolving fields and therefore local standards and approvals are at varying levels of maturity around the world but mostly in their infancy.

Edwards Systems Technology has been setting the trend in establishing the benchmarks for true and reliable integration. Underwriters Laboratories, the approvals authority in the United States, have tested and listed all EST3 access control and security equipment to life safety standards. This elevates the reliability and survivability of access control and security to the level required of fire alarm equipment. As a result intelligent buildings benefit from rock-solid security and access control functions and the synergy true integration creates.

UNIFIED PLATFORM CUTS COSTS, RAISES EFFICIENCY

It is synergy that makes the difference, according to proponents. A truly unified platform is greater than the sum of

> *There is a much higher probability that a relay will fail than a program function will not run. This makes a simpler, more reliable and more user friendly system also less prone to potential failure.*

its parts; a single point of control is more efficient and economical than a patchwork of separate systems that simply communicate with one another.

Louis Fournier, Technical Director for Edwards International points out that there is no need to install separate systems, with separate control panels, separate back-ups, separate PC front-ends and different wiring and interfacing requirements. "This saves a great deal of expense and heartache and makes a much more efficient system." He explains that with a unified control platform, software programming replaces relays, switches and gateways. "For example, a simple programming command can automatically unlock access controlled doors when a fire alarm is initiated or a valid card is presented at the door." He further adds that, while this is already a common procedure among interfaced systems, the EST3 Synergy platform can accomplish this task without additional hardware, software, relays or extra wiring. There is a much higher probability that a relay will fail than a program function will not run. This makes a simpler, more reliable and more user friendly system also less prone to potential failure. According to Mr. Fournier, testing and approving all components of an integrated system for both fire alarm and security applications elevates security and access control to a level of reliability found previously only in dedicated fire alarm systems. "This is exactly what building owners are looking for," he says.

Today we stand at the crossroads of yet another leap forward designing and building intelligent buildings. No doubt there will be resistance and scepticism from the industry to change and embrace the new approach. However, once the benefits are clearly understood and the many advantages of true integration are demonstrated against the inherent problems of the interfaced systems, the choice is obvious. End-users, health & safety officials, local authorities and even contractors will demand this far superior solution from their suppliers. The usual answer of "the fire codes will not allow for this level of integration" will not be good enough. It is only a matter of time before all these psychological barriers to "True Integration" are removed and local standards catch up with the available technology. However, you can always make the most of your investment by choosing tomorrow's technology today. After all it is already proving its worth in real-world applications around the globe . . .

Codes change a

By Jim Simms, P.E. and Sanjay Aggarwal, P.E.

Mall with 24-screen cinema complex

COVERED MALL BUILDINGS (malls) are a way of life in suburban areas and middle sized cities throughout the United States. These facilities not only continue to be a center of retail activity, but they have gradually become a significant social gathering place adding more and larger entertainment venues and food services. Most malls now include a large food court and often numerous restaurants. Multi-screen cinemas are common. Many seniors find enclosed malls to be the place to go for their daily walks. For some people, a weekly visit to the local mall is as routine as going to the Friday night high school football game or to church on Sunday.

The typical code definition of a mall is a single building enclosing various tenants and occupancies, including retail, dining, and entertainment uses, where the tenants have major entrances into a mall. The mall is further defined as a roofed or covered common pedestrian circulation space within the building that allows customers to enter into and circulate between the tenant spaces.

This article briefly summarizes how the codes have changed in the United States to keep up with the covered mall personality.

CODE REQUIREMENTS

The following discussion about the evolution of code requirements/provisions will be in three parts. The first addresses how covered malls were built prior to the adoption of the specific covered mall provisions in the late 1970s. The second part addresses the mall provisions that were in place through the 1990s. The discussion ends with the codes of the early 2000s.

PRE-COVERED MALL PROVISIONS

The early enclosed malls were constructed using a combination of general building code requirements and discussions with local building and fire authorities.

CONSTRUCTION TYPE

A typical mall consists of leasable area in the range of 200,000 to 400,000 square feet (SF) and common walkway interconnecting two or more department stores. The only building construction type that normally allowed unlimited area and addressed the potential of multiple stories and mixed occupancy uses was fire-resistive construction. Therefore, it is not unusual to find the original malls built using this type of construction. However, for those developers looking to utilize a more economical construction type, most building codes afforded the opportunity to use an unlimited area building concept. This code provision allowed 1- and 2-story retail buildings of any construction type permitted by the code, if fully sprinkler protected and separated on all sides by a minimum of 60 feet from all other buildings. This provision allowed an unlimited amount of retail shops, however, the provision usually limited the amount of assembly uses.

Most of the model building codes permitted two levels to be open to one another without special provisions. Therefore, either code approach for achieving the desired building area could be used without the need for additional passive or active fire protection systems, except for the automatic sprinklers required for the unlimited area building approach.

UNRATED CORRIDORS

A key design objective for a mall is to allow customers to look into tenant spaces as they walk between shops. This requires the ability to utilize glass storefronts with glass doors or roll down security doors. Most codes had a provision that allowed the use of non-rated corridor walls when the corridor width was 30 feet or greater, and all tenant spaces had a second exit independent of the corridor (mall). Sometimes it was quite cumbersome to provide this second exit through other potentially leaseable space to reach a rear service corridor. It was not unusual to find jurisdictions that interpreted the code such that if only one exit was required from a tenant space, that exit could be into the common mall.

EXIT PROGRAM

These early malls relied on the exit provisions found in the code. This limited

s malls mature

Typical food court in newer malls with many food tenants and a large seating area

travel distance from within a tenant space to an exit to 200 feet (the typical travel distance for a sprinkler protected building), or 300 feet if the last 100 feet were in a rated exit component. This greater travel distance would often be available using rear exits that discharged into the rear service corridors. The occupant load factors to determine exit capacity for these early malls were based upon the prevailing retail factors which were 30 SF per person on the first floor, and 60 SF on the second floor. Sometimes in a 2-story building with major entrances at both levels, the jurisdiction required 30 SF per occupant on both levels. In this case, there was no distinctive lower floor and upper floor, and therefore higher occupancy densities on both levels were deemed appropriate.

The exit program for the department stores typically utilized the mall entrance to the department stores as an exit from that space. Therefore, the overall exit capacity for the mall needed to incorporate this additional occupant load coming from the department stores.

FOOD COURTS

Those early era malls that contained food courts faced additional issues. By code, these areas typically were not allowed to be open to the main mall (corridor). So often these food courts were found on one side of the mall with a rated separation, or utilized an alternate method to achieve the code intent for the separation. Another issue facing food courts was that with 300 occupants or more, they were required to be located in a building of rated construction. Therefore, if non-rated, non-combustible; or non-rated, combustible construction was utilized, the food court would have less than 300 occupants and be located on the first floor.

FIRE PROTECTION SYSTEMS

If malls were constructed of fire-resistive construction, it was not unusual to find that only the department stores were provided with automatic sprinkler protection. (Department stores were typically required by insurance requirements to be sprinkler protected.) In a mall built under the unlimited area provisions, however, sprinkler protection was required throughout the building.

Since most building codes allowed two levels to be interconnected, there was no specific code requirement to provide mechanical smoke control. Occasionally, older malls are found to have some type of smoke ventilation system. This may include clerestories with panels that can be manually operated by the fire department. In other cases, pop-open roof vents were provided in skylight areas on fusible links that would open under fire conditions.

DEVELOPMENT OF COVERED MALL PROVISIONS

As more and more malls were constructed, building officials and building code groups recognized the need to introduce standardized mall provisions into the codes. The mall provisions that were developed in the late 1970s were in many instances similar to the requirements found in the main body of the various codes. However, the new code provisions adopted an active fire protection system approach to allow greater flexibility in the design of malls. This differs from to the more passive approach previously used.

CONSTRUCTION TYPE

The construction types allowed under the initial mall provisions were essentially the same as the requirements for the unlimited area provisions previously described. 1- and 2-story malls were allowed to be of any construction type permitted by the code provided that the buildings were fully sprinkler protected and were provided with a 60-foot yard or separation around the building, including attached department stores (anchor stores) and parking structures. The building type was limited to a minimum of 1-hour rated non-combustible construction for 3-story malls. The anchor stores and parking structures were considered independent and their building construction type was dependent upon their area and building height. However, these stores were allowed to have a major entrance directly into the mall.

MALL

The new code provisions allowed the mall to be as narrow as 20 feet and still have glazed storefronts and/or security grills. A 10-foot wide clear space was required adjacent to store fronts on both sides of the mall to address exiting requirements. When malls exceeded 20 feet in width, the area in the center of the mall was considered an alternate use area to permit the location of carts, kiosks, benches, and landscaping elements. The mall was considered to be similar to a corridor which lead to major entrances from the surrounding parking lots or attached parking garages.

EXIT PROGRAM

Instead of using the main body of the code to establish the exit program, specific exit criteria were included in the mall provisions. This criteria established occupant load factors that reflected mall usage. It was recognized that as the number of mall tenant spaces increased, the likelihood of all tenant spaces being simultaneously occupied at the maximum density was reduced. Therefore, the occupant load factor for the mall was dependent upon the gross leasable area (GLA) of the tenant spaces. The GLA reflected the number of tenant spaces, therefore, as the GLA increased the load density decreased. For a mall less than 150,000 square feet (SF), the occupant load factor was the traditional 30 SF per person for retail. However, as

Codes change as malls mature

Typical mall common area

the GLA approached 350,000 SF the occupant load factor decreased to 50 SF per person. While this determined the overall occupant load and exit capacity for the entire covered mall building, there was still a need to consider each individual tenant space as potentially being fully loaded at some time. Therefore, each tenant space had to have its exit capacity respond to an occupant load of 30 SF per person.

The travel distances were established considering the active fire protection systems required by the mall provisions (to be discussed later). A maximum 200 ft travel distance was established from the door of any tenant space to reach an exit. Travel within the tenant space was also set at 200 ft to reach the entrance from the tenant space to the mall.

Since the provisions treated the anchor stores as independent structures, their exiting was required to be independent of the mall. Although, each department store has an entrance directly to the mall, this path of travel could not be utilized as part of the exit program for the department store.

FOOD COURT

As the nature of the mall evolved from primarily a retail center to a virtual mixed-use center, food courts grew in size. The number of tenants preparing food and the seating capacity increased significantly. Earlier malls seldom had seating capacity exceeding 300 occupants. However, during the 1980s and 1990s these capacities often reached 800 to 900. The new provisions allowed the seating areas to be open to the mall, but still required them to be located in a building of 1-hour rated construction if above the first floor.

FIRE PROTECTION SYSTEMS

Under the new provisions there was a requirement for malls to be sprinkler protected throughout. The sprinkler systems were required to be zoned such that the sprinkler zones for the mall common area were independent from the zones serving the tenant areas. As part of the active fire protection system approach, the new provisions generally required a mechanical smoke control system in malls. During the 1980s and early 1990s, the required smoke control systems were essentially prescriptive systems requiring a set number of air changes per hour depending upon the volume of the common area. During the mid-1990s the prescriptive approach was changed in at least one of the model codes to provide a performance based system to maintain smoke 10 feet above the upper walking level in the common area. Initiation of the smoke control systems was from sprinkler waterflow alarms, area smoke detection, or a combination of the two. Emergency power was required to maintain operation of these systems should normal power be lost.

In most codes, there was no requirement for an overall fire alarm evacuation system. However, there was a common requirement between all of the codes to have a building public address system, and have the controls for that system made available to the fire department on their arrival. Most codes also required a fire alarm evacuation system for larger assembly occupancies in the malls.

CODES OF THE 21ST CENTURY

Covered mall provisions of the current and upcoming model building codes attempt to address the challenges presented by mall owners, designers, and users. As described earlier, the new malls include more assembly occupancies similar to multi-screen theaters, entertainment venues and food services. Therefore, the earlier concept of considering the primary occupancy of a mall as a retail occupancy and limiting the accessory use has been eliminated by the current model building codes.

The new codes allow malls and anchor buildings up to three stories of any type construction permitted by the code except for wood frame. This is considerably different form the earlier code requirements. Previously, anchor buildings were required to comply with the main body of the code. In addition, the earlier codes did not permit non-rated, non-combustible construction for a three level mall or for assembly occupancies located on levels above ground floor. The new codes have eliminated these restrictions.

The two building codes currently available for adoption in the United States have removed the requirements for a smoke control system in 1-story malls, with one of the codes only requiring mechanical smoke control in 3-story malls. Both of these codes require a fire alarm evacuation system throughout the mall, with one code requiring the evacuation system throughout tenant spaces also. The earlier codes required only a public address system in the common mall area.

CONCLUSION

Building codes have requirements for typical buildings; however, malls are so unique that a separate code section dedicated to malls was developed in the late 1970s. Mall usage has evolved over the years and codes of the 21st century are following the trend to reflect more assembly use. Type of construction and occupancy restrictions are becoming more flexible as a greater emphasis is placed on the active fire protection systems, including new provisions of fire alarm evacuation systems throughout at least the common mall circulation.

Mr. Sanjay Aggarwal, P.E. and Jim Simms, P.E. are consulting engineers with the San Francisco, CA office of Rolf Jensen & Associates, Inc. (RJA). To learn more about RJA, visit their website at www.rjainc.com

Intumex® Forever

No chance for fire.

THE TECHNOLOGY OF FIRESTOPPING and penetration sealing is, like the lives it is there to protect, a journey, and Intumex have travelled a long way in that journey. From their beginnings as part of Chemie Linz AG, Austria's largest chemical production facility almost 30 years ago Intumex have continually developed. That journey took them in 2000 to become part of the international ETEX group, where they have continued to expand their range of products and their technical expertise. They are now a worldwide supplier of firestopping materials and coatings.

Still based in Linz, but with offices worldwide, they have developed a very enviable position as a manufacturer, supplier and, in a lot of cases, a friend to industry, providing solutions and advice for projects all around the world.

From their early days Intumex set bench mark standards with their graphite based intumescent, the first of its kind on the market. Not only was it capable of generating rapidly developing closing pressure, in smaller volumes that the then current products, it was not affected by humidity and moisture in the same way. This made their initial range of products a great success.

It is at this point that a lot of companies would sit back and enjoy the success, but that was not the way with Intumex, they continued to develop new ideas and new products. In a market that is already flooded with 'me too' manufacturers and products, that is not always an easy thing to do. Really true innovation is a rare commodity these days. It is more than renumbering or repackaging the same products, it is developing the product that is needed (and that works), at a price that is realistic. Intumex still continue to work at finding these innovations and bringing them to the market where they give realistic, useable, solutions.

Often the innovations are not always obvious ones. Some are developments in conjunction with customers for special applications, other times they are to assist other areas within the ETEX group.

One recent product innovation was the application of Intumex MG, a pressure forming intumescent sealant, to seal combustible pipe insulation applied to metal pipes passing through coated mineral batt seals. This may sound an easy solution, but getting the right balance of material in the right quantity, so that the insulation is sealed, but the seal itself is not displaced was no easy task. But it was done – and the reason – the customer needed it.

This was innovation where it counts, with the people using the product.

That brings us to another Intumex philosophy, making products user friendly. The Intumex PS Fire Resistant Cushions have an eyelet fixed in one end to allow them to be threaded and pulled through the aperture rather than pushed, making installing the last row so much easier.

But Intumex also look for innovation in the applications. They work with contractors, specifiers, architects and consultants, looking at developing products to suit the markets needs.

These though are only part of Intumex's product range. In addition to the Intumex UC collar they also produce the standard Intumex RS10 pipe collars, for pipes up to 250 mm diameter, in a range of plastics types. Additionally

Intumex PS

You will be impressed with the Intumex fire protection cushions which are dust free and reusable. They prevent fire from spreading through cable and piping penetrations and are ideal for use in rooms with a high density of computer and telecommunications technology.

Intumex V/B/F

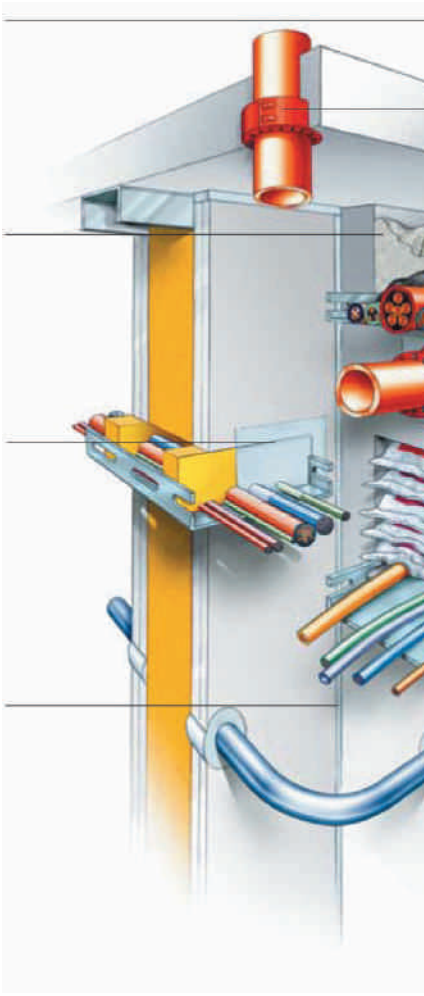
Intumex V is a heat-resistant fire protection mortar that can be used with Intumex B fireproof bricks to provide a rapid solution without having to use any kind of shuttering. An excellent rigid seal is provided with Intumex F fireproof putty.

Intumex CSP

A water-based fire prevention coating. Even when damp the intumescence of the material remains unaffected, making Intumex reliable in damp areas too. Its low pore density prevents cracking during drying and extends the service life. Main area of application: soft seal for cable penetrations in combination with mineral fibre boards. This is also suitable for fire lobbies and plasterboard stud partitions.

Intumex MA

An intumescent fireproof sealing mastic, ideal for sealing building joints. Economical: due to the high performance of this sealant it only needs to be applied on one side, saving time and material. Because of its high elasticity you can use it for expansion joints too. You can paint over it no problem, it is smoke and gas tight at ambient temperature, and it is resistant to water and UV.



going forward . . .

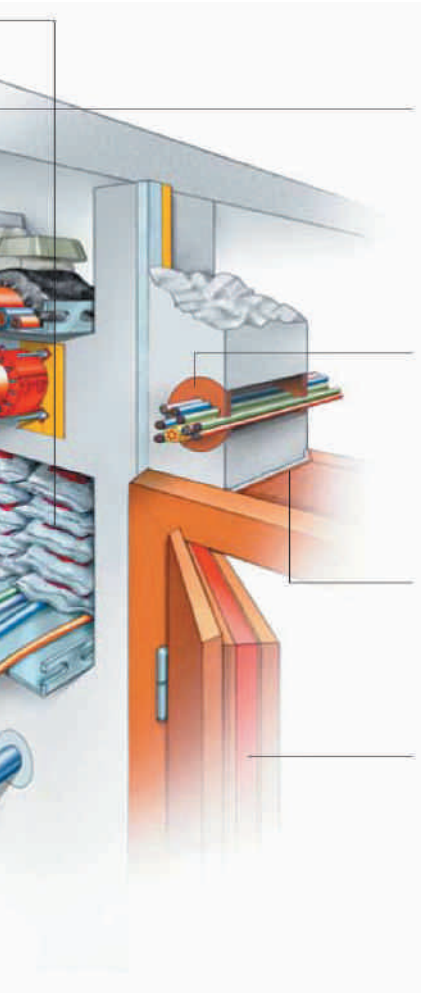
there are a range of mastic sealants, such as Intumex MA (an intumescent with a 15% movement rating), Intumex S (a flexible, high movement, fire resistant silicone mastic), Intumex MG (an intumescent fire and smoke seal) and Intumex MW (an intumescent with more than a 1:13 expansion ration at a minimum of 1.3 MPa pressure).

This is supported by a range of 'standard application' products, such as their coated batt system and mortar, both of which are heavily favoured by contractors for their ease of use and reliability. Their Intumex B bricks can be used in conjunction with the Intumex V mortar to rapidly fill in apertures in both solid and drywall constructions in the shortest time.

Other products include intumescent putty, a flexible intumescent glass cloth fabric and of course various forms of the intumescent sheet and strip products, to suit most applications.

It is often raised in articles on fire protection, and rightly so, that a user should ask ‚does the product meet its claims'. For Intumex that is an important part of their credibility. Their products are extensively tested worldwide, to the appropriate National standards, and to local market requirements. Products have been tested as far apart as from the USA to Australia, and Germany to China.

Tests have recently been conducted in line with the new European Standard, which was published in September, to ensure that the product testing is as up to date as possible.



Intumex RS 10

Single-piece, easy-to-install intumescent pipe collar for plastic pipes. Due to its high performance an Intumex RS 10 collar only needs to be installed on one side of the penetration, either flush mounted or built-in. Is also suitable for plasterboard stud partition walls. Guaranteed for at least 15 years. Resistant to water and ambient influences, high resistance to chemicals, free of organic components.

Intumex MG

An intumescent fireproof acrylic based sealing. It is designed for use with electric cables and joints.

Intumex S

Fireproof silicon.
This silicon is easy to apply and is especially suitable for glazing.

Intumex L

Intumescent fire protection laminate for steel, wood, aluminium and glass doors. This is used as a fire-resistant hot gas seal for steel doors. It can also be implemented in the door frame and/or panel. Intumex L can also be used for F and G glazing.

However, even with the best will in the world, it is not possible to test every application, for every eventuality, no matter how extensive the test programme is. Because of this all products offered from Intumex are supported not just by the tests themselves, but also by a knowledgeable staff with support for providing any engineering solutions that may be required.

A fire resistance test furnace was built at Linz to aid the development of products, and to test the solutions that are developed. This was by no means a small investment, but it is considered a critical one to allow Intumex to maintain their position at the forefront of development and technology. New ideas are constantly being tested and older ones improved.

All new product ideas are first tested here, before the long journey through customer acceptance testing, to certification testing and approvals. A long path, but one Intumex believe to be worthwhile to ensure that they put the right products in the market.

I started with talk of a journey. Intumex are still on that journey, and will continue it for a long time to come. They are aided my the users, the specifiers, engineers and consultants to develop the products that are wanted by industry, today, tomorrow, and long after that. . . .

Next year will see some more product developments from the Intumex stable to increase their range of solutions for the constantly evolving industry we work in. What will they be? That we have to wait and see.

Bernhard Lüdecke

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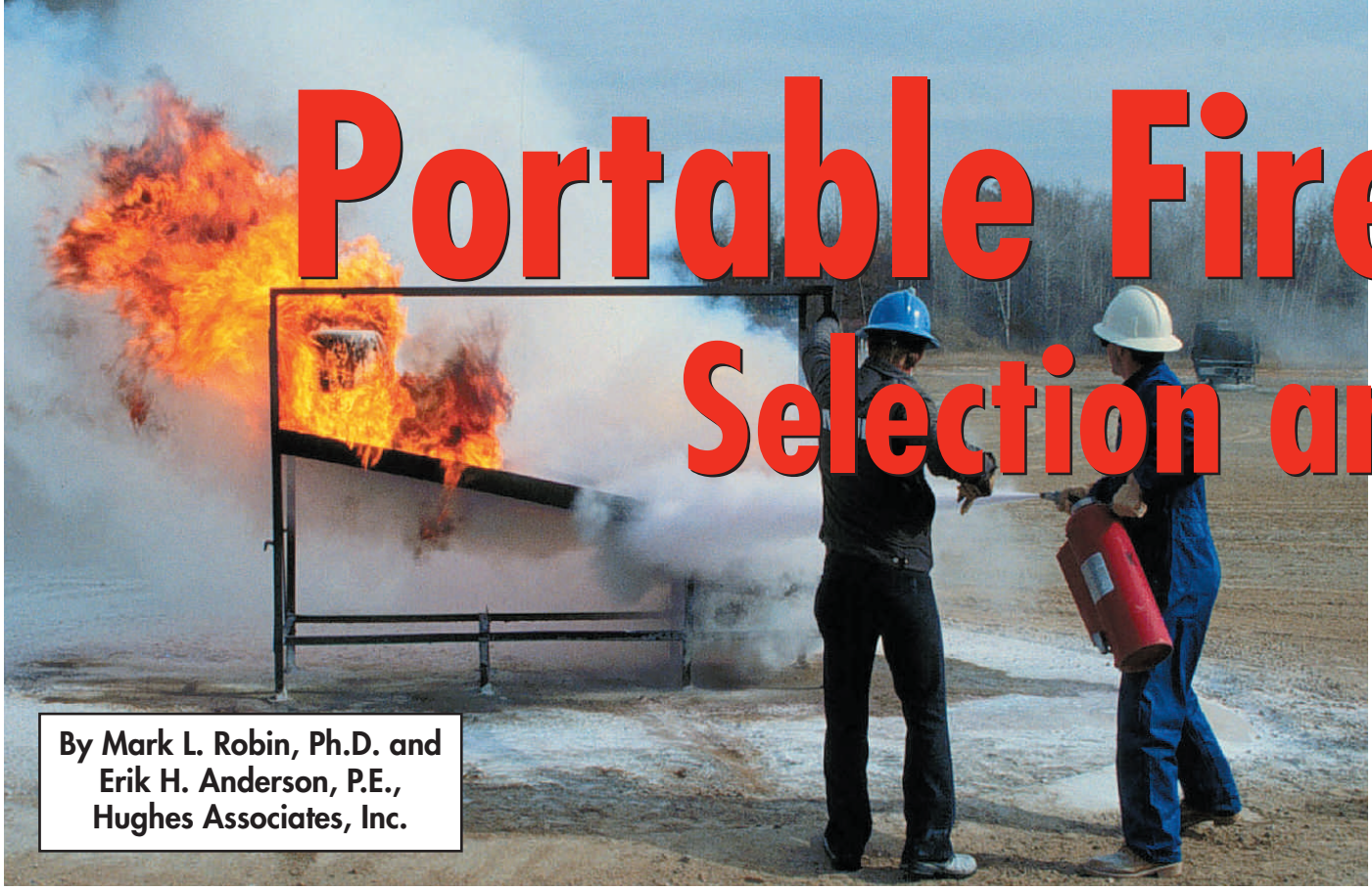
Portable Fire Selection and



By Mark L. Robin, Ph.D. and Erik H. Anderson, P.E., Hughes Associates, Inc.

Pic courtesy of Hughes Associates

IN OUR PREVIOUS ARTICLE (*International Fire Protection*, Issue 18, May 2004) we discussed the classification and rating systems employed by ISO and NFPA for portable extinguishers. In this article, we provide an overview of the selection and distribution of portable extinguishers as described by ISO 11602-1, *Fire Protection – Portable and Wheeled Fire Extinguishers – Part 1: Selection and Installation* (2000 Edition) and NFPA 10, *Standard for Portable Fire Extinguishers* (2003 Edition).

SELECTION OF PORTABLE FIRE EXTINGUISHERS

The selection of portable extinguishers for a given situation should be based upon the type and extent of fires anticipated, the construction and occupancy of the individual property, the hazard being protected, and the ambient temperature conditions. Additional considerations include the ease of use of the extinguisher, the ability of available personnel to operate the fire extinguisher, any anticipated adverse chemical reactions between the extinguishing agent and the burning materials, exposure of operators during fire control efforts, and the upkeep and maintenance requirements of the fire extinguisher.

Portable fire extinguishers must be selected for the specific class or classes of fires (i.e., Class A, B, C, D or K) to be protected against. ISO 3941, *Classification of fires,* and NFPA 10, *Standard for Portable Extinguishers*, provide fire classification criteria based on the nature of the fuel undergoing combustion. Table 1 lists the different types of portable fire extinguishers suitable for a given fire classification. The selection of fire extinguishing agent should be carefully considered, as there are many different types of extinguishing agents available, each with its unique advantages and disadvantages.

■ **Water-based Extinguishers**. Water-based extinguishers include water, water spray, water mist, aqueous film-forming foam (AFFF), film-forming fluoroprotein (FFFP), and loaded stream (water-based units employing an alkali metal salt additive as freezing point depressant). Water-based extinguishers are suitable for use on Class A fires, and foam based fire extinguishers are suitable for use on Class A fires and for flammable liquid or gas fires (NFPA 10 Class B fires and ISO 3941 Class B and C fires). AFFF and FFFP type extinguishers are particularly well suited for use on flammable liquid fires of appreciable depth (greater than approximately 0.64 cm) due to the ability of the agent to float on and seal the liquid surface, thus preventing reignition. Foam based extinguishers are not suitable for use where temperatures are below freezing.

■ **Dry Chemical**. Multipurpose dry powder (ammonium phosphate) is suitable for use on Class A fires, flammable liquid or gas fires (NFPA 10 Class B fires and ISO 3941 Class B and C fires), and electrical (NFPA 10 Class C) fires. Ordinary dry chemical extinguishers employing sodium bicarbonate are not listed for Class A fires, but are effective on flammable liquid or gas fires (NFPA 10 Class B fires and ISO 3941 Class B and C fires) and electrical fires (NFPA 10 Class C), as are dry powder extinguishers employing Purple K (potassium bicarbonate). Class D extinguishers typically employ sodium chloride or copper-based dry powders, and are effective on fires involving burning metals.

■ **Wet Chemical**. Class K extinguishers contain a "wet chemical" typically based on citric or lactic acid, which has the effect of turning cooking oil into a soap-like substance, and smothering the fire. Class K extinguishers are effective for supplementing fire suppression systems in kitchens, and are effective on fires involving cooking oils, fats and grease.

■ **Carbon Dioxide**. CO_2 extinguishers are listed for flammable liquid or gas fires (NFPA 10 Class B and ISO 3941 Class B and C), and for electrical fires (NFPA 10 Class C). CO_2 extinguishers are well suited for fires involving sensitive electrical equipment because CO_2 does not leave a residue after use. For this reason, CO_2 extinguishers are also

Extinguishers: Distribution

Pic courtesy of Hughes Associates

advantageous for protection in food processing areas, laboratories, and printing areas. They can also be used in areas subject to freezing. The disadvantage of CO_2 extinguishers is that they are not listed for use on Class A fires. Additionally, CO_2 extinguishers should not be used outdoors or in areas with high airflow since the agent will quickly dissipate. Discharging a CO_2 extinguisher inside a confined space could potentially create a life safety hazard due to the physiological effects of the agent on humans.

■ **Halogenated**. Halogenated agents are similar to CO_2 in that they are clean agents, i.e., they do not leave a residue following their use. Some large Halon 1211 fire extinguishers are listed for Class A fires. Halon 1211 fire extinguishers are more effective than CO_2 because they have a longer range and require a lower concentration of agent for extinguishment. Halon 1301 is at least as effective as CO_2, but has a lower range than Halon 1211 and is not listed for Class A fires. Halon 1211 and 1301 are included as substances that deplete the ozone layer per the Montreal Protocol signed September 16, 1987, and as a result their use is severely restricted in most countries. Halotron® I extinguishers (a mixture of HCFC-123, PFC-14, and argon) are effective on Class A, Class B and Class C fires. Additional halogenated agents employed in portables include FE-36™ (HFC-236fa) and FM-200® (HFC-227ea). FE-36™ and FM-200® are not subject to the provisions of the Montreal Protocol as they do not lead to the depletion of stratospheric ozone.

Table 1: Selection of Portable Extinguishers

Description of Fire	Fire Classification		Suitable Extinguishers
	ISO 3941	NFPA 10	
Fires involving ordinary combustible materials – e,g., wood, paper, fabrics, rubber, many plastics	Class A	Class A	Water-based Multi-Purpose Dry Chemical Wet Chemical Halogenated
Fires involving flammable and combustible – e.g., petroleum greases, tars, oils, oil-based paints, solvents, lacquers, alcohols	Class B	Class B	AFFF FFFP Dry Chemical CO_2 Halogenated
Fires involving flammable gases	Class C	Class B	AFFF FFFP Dry Chemical CO_2 Halogenated
Fires involving energized electrical equipment	No Classification[1]	Class C	CO_2 Dry Chemical Halogenated
Fires involving burning metals – e.g., magnesium and lithium	Class D	Class D	Special Powder
Fires involving cooking oils, fats and grease	No Classification[1]	Class K	Wet Chemical

[1]ISO 3941 does not define a separate classification for this fire type.

DISTRIBUTION OF PORTABLE FIRE EXTINGUISHERS

The proper distribution of portable fire extinguishers consists of providing the correct size and number of units for a given area to be protected. NFPA 10 and ISO 11602-1 extinguisher distribution criteria are based on several factors including the occupancy hazard classification of the protected area, the size of the area being protected, and the travel distance to the nearest extinguisher.

NFPA 10 and ISO 11602-1 provide similar definitions of the classification of the fire hazard, as follows:

Light (Low) Hazard: total amount of Class A combustible materials is of minor quantity; majority of contents are either noncombustible or so

Table 2: Distribution of Portable Extinguishers – Class A Hazards

Occupancy Hazard	Minimum Extinguisher Rating		Maximum Travel Distance (m)	
	NFPA 10	ISO 11602-1	NFPA 10	ISO 11602-1
Light (Low)	2-A	2-A	23	20
Ordinary (Moderate)	2-A	3-A	23	20
Extra (High)	4-A	4-A	23	15

arranged that a fire is unlikely to spread. Small amounts of Class B flammables can be included if kept in closed containers and safely stored.

Ordinary (Moderate) Hazard: total amount of Class A combustibles and Class B flammables present in greater amounts than expected under light (low) hazard occupancies. Examples include dining areas, mercantile shops, light manufacturing, research operations.

Extra (High) Hazard: total amount of Class A combustibles and Class B flammables present is over and above those expected in occupancies classed as ordinary (moderate) hazards. Examples include woodworking, vehicle repair, aircraft and boat servicing, cooking areas.

■ **Class A and Class B Hazards.** Tables 2 and 3 summarize the NFPA 10 and ISO 11602-1 requirements for the distribution of extinguishers for Class A hazards and flammable liquid or gas hazards (NFPA 10 Class B and ISO 3941 Classes B and C), respectively. Details regarding the maximum floor area allowed per extinguisher for Class A hazards can be found in NFPA 10 and ISO 11602-1. Note that Table 3 applies to flammable liquid hazards that are less than 0.6 cm deep (i.e., not of appreciable depth). For flammable liquids that are greater than 0.6 cm deep, refer to NFPA 10 or ISO 11602-1 for specific requirements.

■ **Electrical Hazards.** Both NFPA 10 and ISO 11602-1 require the placement of extinguishers in areas where energized electrical equipment could be encountered. Since the fire itself is a Class A or flammable gas or liquid (NFPA 10 Class B, ISO 3941 Class B and C) hazard, the size and location of the extinguishers must be based on the Class A or B hazard located in the area being protected.

■ **Class D Hazards.** If fires involving combustible metals are anticipated, a Class D fire extinguisher must be provided in the vicinity. NFPA 10 requires that the travel distance from the hazard to the extinguisher not exceed 23 meters; ISO 11602-1 requires a 20 meter maximum travel distance. The size and number of extinguishers is determined on the basis of the specific combustible metal, its physical particle size and the area to be covered.

■ **Class K Hazards.** NFPA 10 requires Class K extinguishers to be provided in areas where there is a potential for fires involving combustible cooking media. Class K extinguishers typically contain a wet chemical extinguishing agent. If a fixed suppression system other than water sprinklers is provided to protect the cooking equipment, the portable extinguisher unit selected for use in the area should be compatible with the agent employed in the fixed system. The maximum travel distance allowed by NFPA 10 is 9.15 meters. ISO 11602-1 does not contain requirements for Class K hazards.

GENERAL CONSIDERATIONS

Fire extinguishers should be provided in readily accessible locations. Ideally, the fire extinguishers should be placed along the means of egress, including exits from the areas protected.

NFPA 10 and ISO 11602-1 prohibit

Table 3: Distribution of Portable Extinguishers – Class B Hazards

Occupancy Hazard	Minimum Extinguisher Rating[1]		Maximum Travel Distance (m)		Maximum Floor Area Per Extinguisher (m^2)	
	NFPA 10	ISO 11602-1	NFPA 10	ISO 11602-1	NFPA 10	ISO 11602-1
Light (Low)	5-B	55B	9.15	15	Not Specified	300
	10-B	–	15.25	–	–	–
Ordinary (Moderate)	10-B	144B	9.15	15	Not Specified	150
	20-B	–	15.25	–	–	–
Extra (high)	40-B	233B	9.15	15	Not Specified	100
	80-B	–	15.25	–	–	–

[1]NFPA 10 and ISO 11602-1 have different extinguisher ratings for Class B hazards due to the different testing standards employed.

fire extinguishers from being obstructed from view. In large rooms and in locations with obstructed view, a means is required to indicate the extinguisher location. Additional markings, not a part of the device, may be required to indicate the location of extinguishers. Acceptable means of identifying the fire extinguisher locations include arrows, lights, signs, placards, mounting boards, overhead signs, color panels, stripes, cabinets or coding of the wall or column. Preferably, these identifiers should be standardized throughout the facility so that all fire extinguishers are easily identifiable.

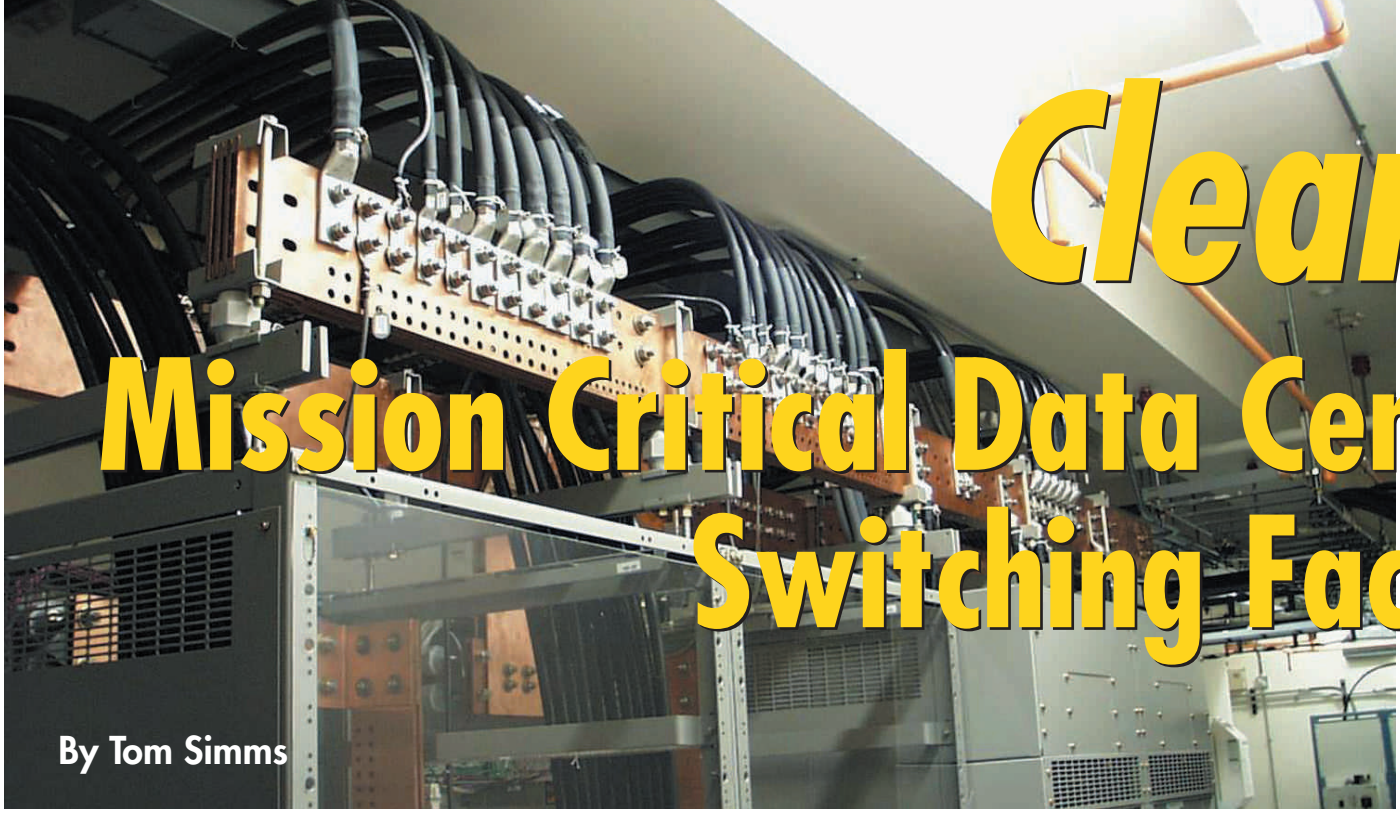
Portable fire extinguishers are required to be installed securely on the hanger or bracket supplied by the extinguisher manufacturer, or placed in cabinets or wall recesses. Fire extinguishers installed under conditions where they are subject to dislodgement are required to be installed in manufacturer's strap-type brackets specifically designed to eliminate this problem. Extinguishers should also be mounted at an accessible height so that occupants can easily dismount them.

CONCLUSION

The intent of this article was to provide an overview of considerations to be taken for the selection and distribution of portable extinguishers. Further details and information may be found in ISO 11602-1 and NFPA 10.

Mark L. Robin, Ph.D., is a Senior Scientist with Hughes Associates, Inc. and has over 15 years of experience in the fire suppression industry, including the development, testing and approval of fixed and portable fire suppression systems.

Erik H. Anderson, P.E., is a Fire Protection Engineer with Hughes Associates, Inc., and has been actively involved in the areas of fire protection system design and fire code consulting.



Clean Mission Critical Data Cente Switching Facili

By Tom Simms

Pic courtesy of The RJA Group, Inc.

PROTECTING THE SPECIAL HAZARD of a computer room data center or a telecommunications switching facility against fire requires an integrated fire model. This article focuses on the gaseous suppression agent as a key element of a mission critical facility fire protection model.

By definition, mission critical environments support operations that are often unique and disruption is detrimental to the business function they serve. Avoidance of an extended business interruption from a fire requires an immediate response that addresses the fire situation without sustained disruption or the necessity for involved post-fire remediation.

Of the various client sites I have reviewed over my tenure, most facilities incorporated a gaseous suppression system on the basis of industry standard or even industry trends. Application of a gaseous suppression agent is sometimes a directive from the client while otherwise a decision of the design professional.

Design professionals should consider what is intended to go right as well as what may go wrong. This article discusses both.

When selecting and applying a gaseous suppression system to protect a mission critical environment, one should consider the following questions:

WHAT ARE THE CLIENT'S EXPECTATIONS OF THE GASEOUS SUPPRESSION SYSTEM?

It is important to understand the clients expectations for the gaseous suppression agent. After spending a significant amount of capital budget on this protection system, the client will experience a peace of mind knowing additional protection is provided. The actual benefit of the suppression system may or may not occur during the lifetime of the facility.

Client's expectations of the gaseous suppression system performance should be discussed with the fire protection design professional. These discussions should explain the suppression system's capabilities, limitations, operation requirements, maintenance requirements, potential for failure, and the side affects of any potential failure to suppress.

A very important aspect to discuss with the client is that some gaseous suppression system manufacturers provide warranties for the system components, but disclaim any warranty that the system and it's agent will extinguish a fire.

WHAT IS THE FACILITY'S FIRE PROTECTION MODEL REQUIREMENTS?

In a majority of the applications, the fire protection engineer or party responsible for design of a mission critical facility chooses to protect the critical operation with a gaseous suppression system. In addition to the decision to incorporate this protection, consider how the gaseous suppression system will interact with a fire scenario as part of the facilities fire protection model.

A mission critical facility fire protection model should consider – *What is the likely fire scenario?* In most mission critical environments, the highest probability will be that the source of the fire is an electrically energized circuit or power supply. With this assumption, a gaseous suppression system applied to suppress an electrical fire (Class C) must have the capability to both extinguish the combustion of materials and inert the ignition source. One must also consider if the gaseous suppression system will extinguish the fire successfully on the first attempt. Extinguishing the fire on the first attempt of agent discharge minimizes the fire's capacity to disrupt or destroy the mission critical operation.

Failure to extinguish a fire on the first attempt introduces several undesirable conditions. The obvious result of a failed suppression attempt is the fire continues to propagate disrupting the mission critical operation, destroying data and/or capital equipment while further reducing the opportunity for rapid recovery from the incident.

GASEOUS AGENTS FOR MISSION CRITICAL APPLICATIONS

During a majority of my tenure consulting in mission critical facility design, the Halon 1301 agent has afforded me the proven confidence that this gaseous agent would address the suppression system requirements of valuable technology spaces and their operations.

Numerous Halon articles were published, extensive and comprehensive application research was performed, that included both laboratory and empirical field testing. Possibly due to the newness of the NFPA 2001, Standard on Clean

Agents:
er and Telecommunications
ity Applications

Pic courtesy of The RJA Group, Inc.

Agents Fire extinguishing Systems, comparable documentation and testing appears to be in limited supply.

Of the documentation available, bench mark testing of the NFPA 2001 recognized Clean Agents, in comparison to Halon 1301, describe lesser results. These new halocarbon Clean Agents are not generally equivalent in their overall effectiveness, require higher concentrations and result in higher decomposition percentages.

Of the most common 2001 Clean Agents being utilized today, HFC-227ea (Commercially known as FM-200) shares the largest installed base of gaseous suppression agents. Clean Agent IG-541 (Commercially known as Inergen) shares a lesser presence in the mission critical facility environment.

The most recent NFPA 2001 recognized Clean Agent C-6 (Commercially known as Novec) has been introduced as a viable mission critical facility agent. As this agent has been recently released to the market, performance analysis by independent testing for mission critical applications is hopefully forthcoming.

ENERGIZED CIRCUITS OR EQUIPMENT – DECISION TO DEPOWER

Inerting the fire's electrically energized ignition source is key factor to successful extinguishment and preventing the re-ignition of the combustible materials.

Depowering of the mission critical equipment operation is not without its consequences. Depowering the data center operation equipment will result in the loss of time and may result in the unrecoverable loss of data and temporary disruption of the business operations. Depowering telecommunications switching equipment may disrupt not only voice conversations, but critical data, and life saving 911 communications. Therefore, the decision to depower must be well thought-out and a risk assessment made on the impact to depower or not.

Depowering was often performed with Halon 1301, but proven through testing not always to be a requirement. Testing of the Halon 1301 agent included several decades of performance in the fire protection market, extensive independent research and testing, and empirical experience has been plentiful. One key attribute of the Halon 1301 agent is it's effectiveness to suppress live, energized circuitry synonymous with mission critical equipment. Thus reducing the reliance on the need to depower.

Some independent lab testing is available pertaining to the performance testing of energized circuits with the newer halocarbon Clean Agents. Laboratory testing for HFC-227ea (commonly known as FM200) indicates the agent's extinguishment capabilities of energized circuits may have mixed results.

A Hughes Associates, Inc study "Final Report – Extinguishment Tests of Continuously Energized Class C Fires" prepared for the Great Lakes Chemical Corporation (Manufacturer of FM-200 Clean Agent) rendered results indicating FM-200 could extinguish a energized circuit fire and inert the energized source. A portion of this test protocol utilized segments of conductors energized with a common electric welder as a power source. Extinguishing performance of the Class C tests were obtained with normal concentrations for an energized duration of 5-minutes.

Conversely, the National Institute of Standards and Technology (NIST) performed similar, but more extensive testing of FM-200's capabilities to extinguish energized circuits. This NIST Test "Clean Extinguishing Agents and Continuously Energized Circuits" utilized a more extensive and comprehensive testing protocol. Their testing results indicated the need for higher than permissible (NFPA 2001) concentration levels of the agent to extinguish an energized circuit fire with lower energy sources than the Hughes Associates protocol test. The NIST tests further documented a significant increase in thermal decomposition of the agent, especially with the increased concentration levels required to extinguish their testing protocol. One important conclusion of the NIST Testing is the need for further testing of full scale (actual data center/telecommunications equipment application) higher energy level fires involving electrically power equipment.

The term "Clean Agent" of the NFPA 2001 Standard refers to the application of the agent in reference to the protected hazard. The Clean Agent when discharged is compatible with mission critical equipment and personnel without any detrimental effects. Should however, a halocarbon agent fail to extinguish and suppress the energized fire source, one must consider decomposition of the agent. This form of contamination is detrimental to most mission critical equipment's continued performance integrity, not to understate this exposure to personnel responding to a fire.

With the gaseous suppression agent as the primary active element of the mission critical fire protection model, an automatic depowering scheme may be most

Pic courtesy of The RJA Group, Inc.

appropriate for use with Halon replacement Clean Agents.

AGENT RETENTION TIME

When utilizing gaseous suppression in the mission critical fire model, the facility's enclosure capability to "hold" the agent's concentration level is strategic. This design and construction detail of the protected hazard's enclosure to retain the agent's minimum concentration level is a key factor to the effectiveness of this portion of the fire protection model.

NFPA 2001 Standard on Clean Agent Fire Extinguishing Systems 2004 Edition does not stipulate a required hold time. Agent hold time must be a consideration of the fire protection model and stipulated in the design criteria. In prior related Standard, the typical hold time was 10-minutes from the time of complete discharge. This time duration is fine for a fire protection model that utilized Halon 1301 as the agent, involved depowering, and included response personnel that could intervene manually with the fire scenario to prevent re-ignition or continued propagation of the fire. One must consider the agent's capabilities, response time by intervening personnel and the respondent's qualifications once the agent has released and is suppressing the fire.

This is especially true for remote, unoccupied or "lights out" mission critical facilities. In a fire scenario where a gaseous agent releases in response to a detected fire, the agent hold time duration is critical to both the extinguishing process and time to permit the responding personnel to determine what action may be required. Without adequate hold time, responding personnel may arrive just in time to see the fire re-ignite.

MISSION CRITICAL RELEASING DETECTION

Detecting the incipient stage of a mission critical fire is imperative to the timely release of the gaseous suppression agent. Traditionally, thermal, ionization or photo-electric spot detectors have been utilized with releasing panel sequences to automatically discharge gaseous suppression agents.

With the advent of the high density equipment information technology platforms, equipment cooling requirements are demanding higher air flows in the mission critical spaces. Traditional spot detector sensitivities are affected at locations including ceilings due to the heat stratification and high air flows. This scenario introduces a dilemma to achieve responsive detection for both notification and timely release of the gaseous agent.

The newer very early warning detection technologies offer some advantages to this traditional detection dilemma. Very early warning detectors with their acute sensitivity permit incipient detection of the early stages of a fire for alert and provide additional levels of detection for timely detection for release of the agent. Their sensitivity however, can also introduce undesirable premature discharges of the gaseous suppression agent. Care must be employed in the application of very early warning detectors serving as releasing detection.

OVERPRESSURIZATION OF THE HAZARD ENCLOSURE

A gaseous suppressed fire protected zone must be designed and constructed to retain the specified design "hold" time of the agent. In addition, a common element of this fire protection model includes smoke control from external sources that would otherwise contaminate the mission critical equipment. Monolithic wall construction combined with vapor barriers, fire caulking of construction joints and enclosure penetrations are instituted to achieve high levels of smoke barriers. Furthermore, air conditioning ductwork entering the protected mission critical zone should be equipped with low leakage dampers to limit smoke infiltration. All these design elements contribute to a well designed and constructed chamber to retain the gaseous agent.

With a low leakage enclosure designed and constructed, overpressurization of this enclosure upon releasing the gaseous agent into this space must be considered. All gaseous agents propelled into these spaces to meet the NFPA Standards for discharge times will produce pressures and impose these pressures on the structural aspects of the enclosure. This includes Halon 1301, and the NFPA 2001 Clean Agents. It is especially pronounced with the inert clean agent due to the significant volume of gas introduced.

Therefore, a venting design to address the pressurization of the enclosure is a key element in the mission critical fire protection model. Failure to coordinate the enclosure strengths with a venting design can result in a breach of the protected enclosure, a loss of agent concentration, and detrimental structural damage to the enclosure and/or facility.

Close consultation is in order with the gaseous suppression manufacturer, the system designer, and the designers of the facility enclosure to assure proper venting is achieved.

AGENT/SMOKE EVACUATION

Means to evacuate the discharged agent from the protected enclosure once it has either extinguished the fire or failed should be consider a part of the fire protection model. This system should be operated by qualified personnel on their determination the agent was successful or has failed and may be decomposing along with any fire byproducts causing further damage to the mission critical operation. Optimally this evacuation system is a powered mechanical ventilation system capably designed and dedicated to this function.

CONCLUSION

Creation of a mission critical fire protection model must consider many application, design, and operational aspects in selecting a suppression agent.

ENDNOTES

NFPA 2001 Standard on Clean Agent Fire Extinguishing Systems 2004 Edition, NFPA, One Batterymarch Park, Quincy, MA.

Hughes Associates, Inc Baltimore MD. "Final Report – Extinguishment Tests of Continuously Energized Class C Fires" prepared for the Great Lakes Chemical Corporation"

National Institute of Standards and Technology (NIST) Mark R. Driscoll, Paul E. Rivers of the 3M Company, St. Paul, MN. "Clean Extinguishing Agents and Continuously Energized Circuits"

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The Path At Your Feet

By James D. Amy, Jr.

Pathway marking in cruise ship stair *Pic courtesy of The RJA Group, Inc.*

The Shift in Emergency Lighting

FOR THOSE IN THE field of pathway marking, predicting the shift towards emergency lighting at the floor level was logical. Experience has shown that traditional overhead lighting, both normal and emergency lighting, could become obscured by smoke during a fire, a contributing factor in many high fatality fires. Close to a fire, smoke is hot and dense and rises to the ceiling. Farther from a fire, smoke may have cooled and dispersed to the point where it fills the corridor, possibly obscuring distant exit signs. Pathway marking has been recognized as a means to maintain visibility of the egress path if smoke obscures overhead lighting and signage. Unlike emergency lighting, pathway marking provides occupants with a continuous pathway delineation at their feet about how best to egress. However, the shift has now begun from employing pathway marking to supplement emergency lighting to having it replace emergency lighting altogether.

BACKGROUND

The realization that occupants needed a continuous indicator of the egress path began in the United States with aisleway marking on commercial aircraft in the 1980s. Certain types of buildings in California were required to have pathway marking as of 1989, followed in 1993 by cruise ships and ferries. The late 1990s saw the development of pathway marking requirements for commuter trains. Recent years have seen the need for these systems more broadly in buildings, tunnels, and railway and subway platforms. Each application was associated with unfortunate tragedies where occupants were unable to find their way out. For example, the Scandinavian Star fire in 1990, which killed 158, was a turning point for the cruise line industry. Safety requirements for sprinkler systems and Low-Location Lighting, the maritime equivalent of pathway marking, were rapidly enacted subsequent to the fire.

For buildings in the U.S., September 11th was the turning point. In the Pentagon, some occupants were unable to find their way out because of the massive fire that ensued after Flight 77 slammed into the building. Renovations to the Pentagon included the addition of a pathway marking system to enhance egress. In the World Trade Center, a pathway marking system had been installed subsequent to the 1993 bombing that left the stairs in complete darkness. While battery-powered emergency lights were also installed in the stairs and remained operative for much of the time prior to the building collapses on the morning of September 11th, the pathway marking assisted occupants in their movement. It identified a path to safety that was otherwise unclear to some occupants.

The United Nations, the City of New York, and several branches of the U.S. government, among others, have recognized as a result of September 11th that pathway marking systems can be a critical component to safety. New York City has proposed changes to its building code to require pathway marking systems in the stairs of all high-rise buildings. The United Nations initiated installation of a pathway marking system in all corridors and stairs in their complex two years ago. The owners of several high rise buildings in New York have voluntarily installed a pathway marking system.

REPLACING EMERGENCY LIGHTING

It should come as no surprise that pathway marking systems are increasingly being recognized as serving in part or in whole as the emergency lighting system as opposed to simply a supplemental system. This has been the case in stadiums and theaters in Australia, New Zealand and the U.S. where lighting each step with non-electric, photoluminescent material has been accepted. Photoluminescent materials are charged by ambient light and will glow in the dark should power be lost or smoke obscure overhead lighting.

Recently, New Zealand proposed changes to their building code that would allow pathway marking in lieu of emergency lighting. It is likely that other countries will follow suit in coming years. This is not to say that pathway marking systems are suitable for all applications of emergency lighting. Overhead lighting can be unavoidable, such as on a convention room floor where the path will change based on the exhibits that have been set up.

The Path At Your Feet

Pathway marking under normal and blackout conditions *Pic courtesy of NRC Canada*

EXIT SIGNAGE

One objection to pathway marking replacing emergency lighting has always been that pathway marking does not illuminate the means of egress as brightly as emergency lighting. There was a similar objection to photoluminescent exit signs prior to their acceptance by Underwriters Laboratories as performing equivalently to electrical exit signs. While not as bright as electrically-powered exit signs, they were bright enough to be read from the prescribed distance after 90 minutes in darkness. While objections to these signs persist, no substantiation has been provided to prove that they do not accomplish the goal of identifying the exit.

The advantage to photoluminescent exit signage is that once it is charged, it will work regardless of the conditions. There are no batteries, bulb, or electrical components that have to be maintained and can fail during an emergency. It is not uncommon to find electrically-powered exit signs inoperative. This is a function more of a lack of maintenance than a failure of a particular brand or type of sign but it highlights the weakness of the technology. Photoluminescent materials, by comparison, are more accommodating of neglect.

Another objection to photoluminescent exit signs is that they require ambient lighting in order to be charged. This is true but building owners and managers do not generally ignore burned-out overhead lighting. The locations where this argument *is* valid is in locations where overhead lighting is activated by motion sensors and only powers up when someone enters the space or where lighting levels are inadequate for charging the sign. As some new energy codes require that lighting in certain rooms be motion activated, use of photoluminescent products must be carefully coordinated with use of motion activators to avoid installing them in locations that will be normally unlit.

An interesting aside is the 2004 modification of the Environmental Protection Agency's EnergySTAR Program to include photoluminescent exit signs since they consume no power.

DEFINING THE EGRESS PATH

The aforementioned charge that pathway marking is not as bright as overhead emergency lighting bears discussing. Overhead lighting illuminates the occupant's surroundings. Pathway marking identifies only those elements of the surroundings that are necessary for egress. While pathway marking may illuminate slightly the walls and ceiling, its main objective is to identify the steps, handrails, and landing so that occupants can locate them without having to consider whether what they are seeing is a step, handrail, or landings.

It is not necessary to illuminate the entire space to identify the key elements to egress. This is why pathway marking can accomplish its goal without providing the light levels associated with overhead emergency lighting. In fact, a 1999 study by the National Research Council of Canada (NRCC) demonstrated that occupants who had never seen a pathway marking system had no difficulty descending the stairs during an unrehearsed drill and their egress speed was comparable to that in the other building stairs that were fully lit or lit by emergency lighting. The NRCC concluded the study by stating that photoluminescent pathway marking "appears to be a cost-effective addition or even a potential replacement for traditional electrical emergency lighting, since it does not consume energy, requires no wiring, needs minimum maintenance and is totally reliable, provided it is installed in locations where permanent full lighting is provided."

OCCUPANT BEHAVIOR

To fully appreciate why pathway marking is an asset to occupants, it is necessary to consider their behavior during an emergency. While panic was long ago thought to occur commonly during emergencies, it has now been recognized to be the exception rather than the rule. Instead, occupants tend to act in a rational manner, especially when they have confidence in their ability to reach the exit. Unfortunately for occupants, traditional emergency lighting does not provide any more clues as to how to egress than they have under normal conditions. If they are unfamiliar with their surroundings, the burden is on the occupants to spot the discrete exit signs that may be up to 100 feet away. Pathway marking, by comparison, is always within reach along the egress path and the psychological benefit to occupants of this feature should not be underestimated.

Walking up or down many flights of stairs is not an activity that occupants engage in on a daily basis. Occupants in high-rises use the elevators to reach their destinations. This has bred ignorance as to what to do in the case of an emergency. As they are unfamiliar with the stairs, occupants are similarly unfamiliar with even the location of the exits on their floor. In addition, some stair doors in high-rise buildings are alarmed so that

The advantage to photoluminescent exit signage is that once it is charged, it will work regardless of the conditions. There are no batteries, bulb, or electrical components that have to be maintained and can fail during an emergency.

occupants are not even provided with the opportunity to familiarize themselves with the stairs should they be so inclined.

When descending many flights of stairs under normal conditions, the monotony of the body's motion and the environment challenges an occupant's attention to details. This behavior is only amplified during an emergency when the occupant is so focused on placing one foot in front of the other and on clutching the handrail that they lose their awareness of others in the stair and of their progress towards the exit. One survivor of September 11th, Mr. Al Masetti, has recounted this "tunnel vision" during his decent from the 73rd Floor of the North Tower. Unlike many of his fellow occupants, Mr. Masetti was familiar with the stairs. He was also familiar with horizontal transfer corridors where the stairs shifted (a corridor led from where one flight ended to where the next flight began). He was also aware of the pathway marking and used it to guide him along the path. It gave him confidence to move forward as he knew it led to the exit.

As Mr. Masetti moved along one of the horizontal transfer corridors, someone ahead of him wandered off the exit path and headed towards a door that led away from the exit. Others ignored this behavior and seemed unaware that someone had strayed. Mr. Masetti redirected the man to follow the pathway marking. The man seemed a bit dazed; many of the other occupants were likely in a similar state of shock in light of the attack. To expect that occupants during an emergency will think with the same depth as they do normally is unreasonable. Providing them with simple, intuitive, and continuous direction corresponds to what they can be expected to absorb.

Thankfully, September 11th was not a typical emergency scenario. Additionally, few buildings are as tall as the Twin Towers were. However, as shown by the power outage suffered by the northeastern U.S. in August, 2003, a loss of lighting in the stairs can cripple occupant movement. Not all buildings in New York City are required to have emergency lighting. Some have generators but the generators failed. Others had battery-powered lights but the batteries died within an hour or so of the extended blackout. Some occupants were able to leave their offices in the first hour but found that they had to walk up the stairs to their apartment and into hallways in complete darkness. While a power outage does not pose the same threat to life as that posed by a fire, the increased potential for occupants to be injured as they descend an unlit stair is unacceptable and unnecessary.

TECHNOLOGY AND HISTORY

There are two major types of technology that can be used for pathway marking.

Pathway marking in World Trade Center on September 11th

The first is electrically-powered. On cruise ships, most of the electrically-powered systems are LED-based and are reportedly not burdensome to maintain. Unfortunately, there was reportedly a failure of an electrically-powered system during the 1998 *Ecstasy* fire. According to the National Transportation Safety Board, the control panel on the ship's bridge sounded a trouble alarm and could not be silenced; The Chief Electrician cut power to the system, rendering it inoperative throughout the ship. Two crewmen were unable to find their way out through the thick smoke and took refuge in a bathroom. The trapped crewmen were discovered later by a search team and rescued.

The above incident demonstrates that regardless of maintenance, an electrically-powered system can still fail. Additionally, such systems are dependent on the same source of emergency power as the emergency lighting. If emergency power fails, such as occurred in New York City during the blackout when emergency generators failed to start up, neither the overhead emergency lighting nor the pathway marking will be powered.

The other type of technology used in pathway marking systems is photoluminenscence. Photoluminescent materials absorb light under normal conditions. If power is lost or lights are obscured, the glow from photoluminescent materials becomes evident. While it is true that these materials are not as bright as LEDs, they will glow for many hours regardless of conditions during the emergency. They cannot be turned off but, as the hours pass, the glow will diminish, as the energy absorbed prior to the onset of the emergency is expended, similar in concept to a battery running through its charge. However, in the first one or two hours, high quality, safety-grade photoluminescent materials will glow brightly and enable occupants to find their way to the exit.

MOVING FORWARD

In the past twenty years, pathway marking has evolved from a concept on commercial aircraft to help passengers escape in the space of a couple of minutes to systems that are installed throughout buildings and office complexes millions of square feet in area and throughout every passageway and stairway in every cruise ship in the world. While on an airplane, this system might mark a path of one- or two-hundred feet, on a cruise ship, the numerous paths may constitute many miles of marking. Tunnels and buildings may also make use of miles of pathway marking.

Debate may continue as to the value of pathway marking but the trend has been in the direction of a broader use and of the replacement of traditional emergency lighting by pathway marking systems. Fires and other emergencies will continue to occur. Time will eventually provide enough examples of fires in occupancies fitted with pathway marking to objectively evaluate the value of these systems.

Mr. James Amy is a consultant for Rolf Jensen & Associates, Inc., based in Chicago, IL USA. To learn more about RJA and their capabilities, visit their website at www.rjainc.com

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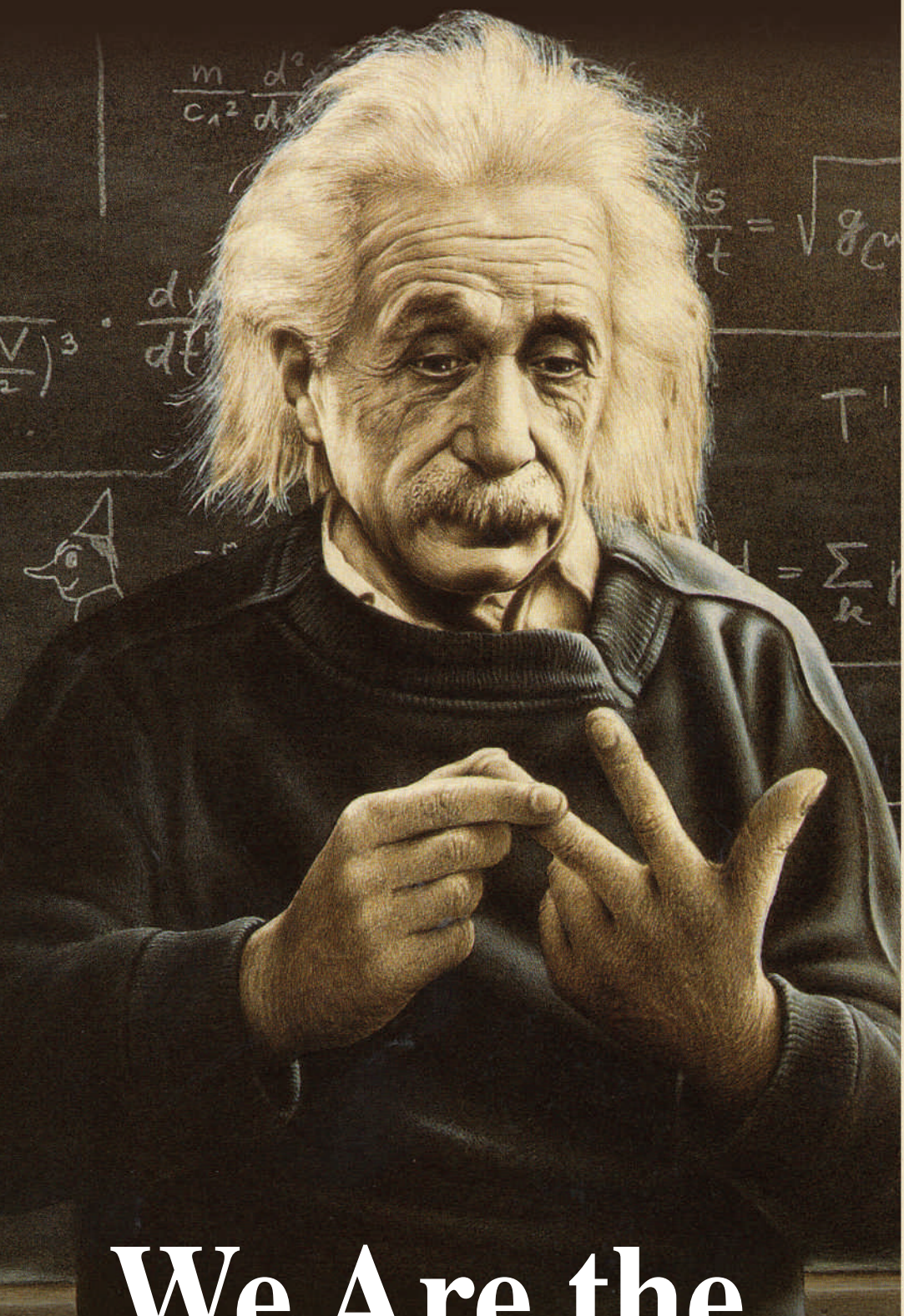

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Halocarbon Clean Extinguishing Agents:

Environmental Regulations

THE CLEAN EXTINGUISHING AGENTS were developed in direct response to the issue of stratospheric ozone depletion, and can be classified as inert gas-based or halocarbon-based agents. Inert gas agents are comprised of a single inert gas, or a combination of inert gases, and are characterized by zero ozone depletion potentials (ODPs) and low or zero global warming potentials (GWPs). Halocarbon-based clean agents are comprised of single halocarbons or mixtures of halocarbons, and are characterized by low or zero ODPs and non-zero GWPs.

By Mark L. Robin, Ph.D
Hughes Associates, Inc.

In the current clean agent fire suppression marketplace, much confusion exists as to the regulation of the halocarbon clean extinguishing agents. In this article the current status of international, European and U.S. environmental regulations related to the use of the halocarbon clean extinguishing agents is detailed.

HALOCARBON CLEAN EXTINGUISHING AGENTS

Table 1 indicates the composition of a selection of halocarbon clean extinguishing agents, and Table 2 summarizes the environmental properties of the halocarbons. The halocarbons employed in clean agent systems include hydrofluorocarbons (HFCs) such as HFC-227ea and HFC-125, hydrochlorofluorocarbons (HCFCs) such as HCFC-123 and HCFC-124, and a single perfluoroketone (FK-5-1-12).

Agents which are comprised of or contain ozone depleting substances (ODSs), i.e., agents containing compounds characterized by a non-zero ODP, are subject to the provisions of the Montreal Protocol. Hence, the use of NAF S III and Halotron I is regulated by the Montreal Protocol.

The remaining agents in Table 1 do not contribute to the depletion of stratospheric ozone, i.e., they are characterized by an ODP of zero. As a result, they are not subject to the provisions of the Montreal Protocol. These agents are, however, greenhouse gases (GHGs), and are therefore subject to the provisions of the United Nations Framework Convention on Climate Change (UNFCCC).

INTERNATIONAL REGULATION OF HCFCS

In response to the threat of stratospheric ozone depletion, the United Nations Environment Program (UNEP) developed an international framework to control the emissions of ozone depleting substances (ODSs), which ultimately led to the establishment of the Montreal Protocol on Substances That Deplete the Ozone Layer (the "Montreal Protocol") in 1987. In 1990, Parties to the Montreal Protocol identified HCFCs as transitional substitutes for chlorofluorocarbons (CFCs) and other ozone depleting substances, and in 1992 the Parties created a detailed phaseout schedule for the HCFCs.

All developed (non-Article 5) countries that are parties to the Montreal Protocol are subject to a cap on their consumption of HCFCs, consumption being defined as production plus imports minus exports. The cap is set at 2.8% of that country's 1989 CFC consumption *plus* 100% of that country's 1989 HCFC consumption. Table 3 shows the Montreal Protocol schedule for phasing out the HCFCs.

Table 1. Halocarbon Clean Agents

Tradename	Manufacturer	Chemical Formula	Contact Information
FM-200	Great Lakes Chemical	CF_3CHFCF_3	www.fm-200.com
FE-227	Du Pont	CF_3CHFCF_3	www.dupont.com/fire
FE-25	Du Pont	CF_3CF2H	www.dupont.com/fire
FE-13	Du Pont	CF_3H	www.dupont.com/fire
FE-36	Du Pont	$CF_3CH_2CF_3$	www.dupont.com/fire
NAF S 125	Safety Hi-Tech, Srl	CF_3CF_2H 0.1% D-limonene	www.safetyhitech.com
NAF S III	Safety Hi-Tech	4.75% CF3CHCl2 82% CF2HCl 9.5% CF3CHFCl 3.75% D-limonene	www.safetyhitech.com
Novec 1230	3M	$CF_3CF_2C(O)CF(CF_3)_2$	www.3m.com
Halotron I	American Pacific	CF_3CHCl_2 (major)	www.halotron-inc.com

Table 2. Environmental properties of the Halocarbon Clean Agents

Fluorocarbon	Chemical Formula	ODP	GWP (100 year)	Atmospheric Lifetime (years)
HFC-227ea	CF_3CHFCF_3	0	3,500	36.5
HFC-236fa	$CF_3CH_2CF_3$	0	9,400	209
HFC-23	CF_3H	0	12,000	264
HFC-125	CF_3CF_2H	0	3,400	32.6
HCFC-123	CF_3CHCl_2	0.02	120	1.4
HCFC-124	CF_3CHFCl	0.022	620	6.1
HCFC-22	CF_2HCl	0.055	1700	11.9
FK-5-1-12	$CF_3CF_2C(O)CF(CF_3)_2$	0	1	0.02 – 0.04

Table 3. Montreal Protocol Phaseout Schedule for HCFCs

Year of Implementation	Reduction in Consumption[a]
2004	35%
2010	65%
2015	90%
2020	99.5%
2030	100%

[a]Employing 1989 consumption as the baseline

For undeveloped countries, consumption levels are froze at 2015 levels on January 1, 2016, and a total phaseout is scheduled for January 1, 2040. Thus, a complete phaseout of HCFCs occurs under the Montreal Protocol between the years 2030 and 2040, depending upon the classification of the individual country as developed or developing.

Halocarbon clean extinguishing agents subject to the provisions of the Montreal Protocol are those containing ozone depleting substances, i.e., the HCFC-based agents NAF-S-III and Halotron I.

EUROPEAN REGULATION OF HCFCS

The Montreal Protocol is implemented in the European Union (EU) through EC Regulation 2037/2000. Chapter II, Article 3, paragraph 3 of EC Regulation 2037/2000 details the phaseout schedule for HCFCs. HCFC production is limited to 35%, 20% and 15% of the base year (1997) production level by the end of 2008, 2014, and 2020, respectively. The production of HCFCs is prohibited after December 31, 2025.

Under Chapter II, Article 5, paragraph 3 of EC Regulation 2037/2000, the use of HCFCs as fire suppression agents to replace halon in existing suppression systems is permitted only for the critical uses of halon defined in Annex VII of EC Regulation 2037/2000. In addition, the halon must be completely removed and destroyed and 70% of the destruction costs must be covered by the HCFC supplier.

U.S. REGULATION OF HCFCS

In 1993, the U.S. EPA, as authorized by Section 606 of the Clean Air Act of 1990, established a schedule implementing the phaseout of HCFCs in accordance with the Montreal Protocol. The current HCFC phaseout schedule in the United States in shown in Table 4.

Under the Clean Air Act, the production and import of the HCFCs employed in clean agents, i.e., HCFC-22, HCFC-123, and HCFC-124, will be banned by 2015.

INTERNATIONAL REGULATION OF HFCS

HFCs (and the fluoroketone FK-5-1-12) are characterized by zero ODPs, and as a result are not subject to any of the provisions of the Montreal Protocol. These agents are, however, greenhouse gases (GHGs), and are therefore subject to the provisions of the UNFCCC.

As a result of concerns over the effects of climate change (i.e., global warming), most countries joined the UNFCCC more than a decade ago. The UNFCCC is an international treaty, and sets an overall framework for intergovernmental efforts to address the challenges posed by climate change. Under the UNFCCC, governments collect and exchange information on GHG emissions, and establish strategies for addressing these emissions. In 1997 an amendment to the UNFCCC treaty, the Kyoto Protocol to the United Nations Framework Convention on Climate Change (the "Kyoto Protocol") was adopted by consensus at the third meeting of the Conference of Parties (COP3) to the UNFCCC.

The goal of the Kyoto Protocol is to reduce GHG emissions. Key aspects of the Kyoto Protocol include emissions targets, timetables for industrialized nations, and the development of policies and measures for meeting those targets. The Kyoto Protocol covers a "basket" of six GHGs: carbon dioxide, nitrous oxide, methane, hydrofluoro-carbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride. Other greenhouse gases, such as chlorofluorocarbons (CFCs) or hydrochlorofluorocarbons (HCFCs) are not subject to the provisions of the Kyoto Protocol since their use is controlled by the Montreal Protocol.

The Kyoto Protocol does not call for the phase-out or banning of any GHGs. The goal of the Kyoto Protocol is the overall reduction of GHG emissions.

The Kyoto Protocol will likely come into force early next year. In order to

Under Chapter II, Article 5, paragraph 3 of EC Regulation 2037/2000, the use of HCFCs as fire suppression agents to replace halon in existing suppression systems is permitted only for the critical uses of halon defined in Annex VII of EC Regulation 2037/2000.

The Draft has passed the EU Parliament First Reading, and has been agreed by the Council; it will now be presented for the Second Reading in Parliament and is likely to come into force towards the end of 2005 or in early 2006.

come into force, the Protocol needed to be ratified by 55 countries that produce 55 percent of the developed world's 1990 carbon dioxide emissions. The required number of ratifying countries has been met with the recent ratification of the Protocol by the Russian Federation. Ratification of the Protocol by the State Duma occurred on October 22, 2004, and the Protocol was ratified by the Federation Council on October 27, 2004. On November 4, 2004, President Vladimir Putin signed the Protocol. The next step is the depositing of the formal instrument of ratification with the Secretary-General of the United Nations in New York. The Kyoto Protocol would then enter into force 90 days later.

EUROPEAN REGULATION OF HFCS

The European Commission (EC) has been working on its European Climate Change Program (ECCP) since June 2000. In August 2003 the EC proposed a new EC Regulation on fluorinated gases, entitled Proposal for a Regulation of the European Parliament and of the Council on Certain Fluorinated Greenhouse Gases. The proposal is a key element of the first phase of the ECCP, and will put into place a legislative framework to reduce emissions of HFCs, PFCs, and sulfur hexafluoride. The Draft has passed the EU Parliament First Reading, and has been agreed by the Council; it will now be presented for the Second Reading in Parliament and is likely to come into force towards the end of 2005 or in early 2006. The proposal includes provisions on the containment, reporting, marketing, and use of fluorinated gases. Nowhere in the proposal is there a call for production bans or limits on HFCs employed in fire suppression applications.

U.S. REGULATION OF HFCS

On March 18, 1994, the U.S. EPA published its Final Rulemaking for its Significant New Alternatives Policy (SNAP) rule. This Rulemaking listed acceptable substitutes for CFCs in the major end use sectors, including the fire suppression sector. The U.S. EPA currently has no policy for the regulation of HFCs or fluoroketones in fire suppression applications.

SUMMARY

In summary, the HCFC-based clean extinguishing agents are subject to the provisions of the Montreal Protocol. Under the provisions of the Montreal Protocol and the provisions of national regulations such as the Clean Air Act in the United States and EC Regulation 2037/2000 in the EU, HCFCs are scheduled for eventual phaseout.

Conversely, the HFC-based clean agents are not subject to the provisions of the Montreal Protocol, but are subject to regulations related to climate change, i.e., the Kyoto Protocol and the EU Proposal for a Regulation of the European Parliament and of the Council on Certain Fluorinated Greenhouse Gases. None of these regulations impose limits on the use of HFCs as fire suppression agents, and none propose any bans of HFCs in these applications. Worldwide, only Iceland and Denmark do not currently permit the use of HFCs in fire suppression. Switzerland and Austria restrict the use of HFCs in fire suppression, and Norway and Australia impose a tax. Acceptance of the EU Draft on Fluorinated Gases would in effect revoke the ban on HFCs in Denmark and revoke the use restrictions in Austria, leaving Iceland as the only country not permitting the use of HFCs in fire suppression applications.

In this article we have provided a snapshot of the current status of environmental regulations related to the use of the halocarbon-based clean agents in fire suppression applications. It is important that end-users keep abreast of any future changes in these regulations to ensure compliance with the applicable environmental regulations for a particular country.

Table 4. Implementation of HCFC Phaseout through Clean Air Act Regulations

Year to be Implemented	Clean Air Act Regulations
2003	No production or import of HCFC-141b
2010	No production or import of HCFC-142b or HCFC-22 except for use in equipment manufactured before 1/1/2010
2015	No production or import of any HCFCs, except for use as refrigerants in equipment manufactured before 1/1/2020
2020	No production or import of HCFC-142b or HCFC-22
2030	No HCFC production or import

Mark L. Robin, Ph.D., is a Senior Scientist with Hughes Associates, Inc. and has over 15 years of experience in the fire suppression industry. He has been extensively involved in the development, testing and approval of halon alternatives, including inert gas and halocarbon-based clean agents.

Latest developmen for Aspirating S

By PDG Massingberd-Mundy
Vision Systems (Europe) Ltd,
Hemel Hempstead, UK

Flaming Neptane *Picture courtesy of CNPP, France*

THE MANY BENEFITS OF Aspirating Smoke Detectors (ASDs) are now widely recognised and the technique is used in many diverse applications; from very early warning applications in telco facilities and clean rooms to unusually dirty applications in flour mills and coal fired power stations – and many applications in between. In recognition of the continuing growth in the application of ASD systems several standards across the world now make reference to them. Most recently, in Europe, CENC72WG16 has completed a product standard which introduces a classification system for ASD sensitivity, in recognition of the diversity of applications in which it is used.

In addition to this product standard several national groups are working on new or existing application guides to incorporate the new ASD classification system introduced by prEN54-20. In particular, BFPSA has recently circulated the first draft of a revision to its CoP for Aspirating systems.

There is no doubt that classification systems are only truly useful if they are fully relevant to the technology and most importantly the application of that technology. To achieve this, wide participation, consultation and understanding at an early stage is essential. The primary aim of this article is to ensure that prEN54-20 and the BFPSA CoP benefit from a variety of inputs to ensure that the final versions are truly useful to the successful application of ASD systems in the field.

THE DRIVERS FOR USING ASD SYSTEMS LEADS TO THE DEFINITION OF 3 CLASSES

TC72 is the CEN Technical Committee mandated by the European Commission to develop an ASD Product Standard. This work is being done by Working Group 16 who, during their first meeting in September 1999, considered the many applications for ASD systems and identified the following seven drivers as encompassing the main reasons for installing an ASD system.

- Environmentally challenging areas
- Aesthetics and concealed detection are important
- Maintenance access is limited
- Smoke is difficult to detect (e.g. high airflows, high ceilings or open areas)
- Earliest detection to enable business continuity
- Extra time is required for safe evacuation
- Unnecessary suppression release must be avoided

These driver demonstrate why ASD systems are installed in a wide range of applications, from clean rooms, computer suites and telecommunication facilities to heritage buildings, prisons, shopping complexes and industrial facilities. Moreover, it was observed that these seven drivers break down into three core attributes of the ASD technology:

- early warning/high sensitivity,
- cumulative sampling providing enhanced protection
- flexibility of design.

Considering these three core attributes the working group have defined a Classification system with three sensitivity levels:

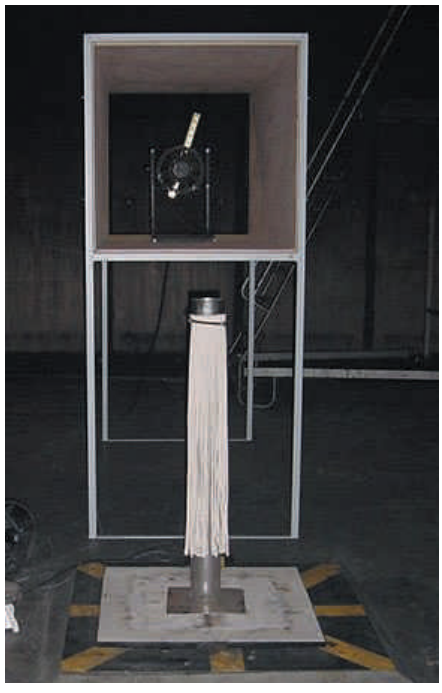
- **Class A** – very high sensitivity
- **Class B** – enhanced sensitivity
- **Class C** – normal sensitivity

These essentially address the three core attributes identified above and have enabled TC72WG16 to develop a product standard that covers the whole range of aspirating systems.

THE CUMULATIVE EFFECT

To have confidence that the detection performance of an ASD system is effective, it has been usual to demonstrate that the detection performance of a single hole is equivalent to a point detector. It must be recognised that ASD systems have an inherent dilution whereby smoke entering one active hole is diluted by clean air entering other holes. Therefore, to achieve the necessary performance, the central detector must be more sensitive than a standard point detector. In recognition of this the sensitivity classes of prEN54-20 relate to the *system performance* NOT to the sensitivity of the central detector.

However, when viewed for a different perspective, this *dilution* effect is, in fact, one of the unique benefits of an ASD system and gives them the ability to reliably detect lower concentrations of smoke than a normal point detector – not only because the single central detector typically



Smoldering cotton wicks
Picture courtesy of CNPP, France

ts in the standards moke Detectors

VESDA LaserFOCUS – the latest ASD product to be launched in the UK

incorporates more advanced detection technology than a low cost point detector – but also because ASD systems effectively become *more* sensitive *when* smoke enters more than one sampling point. In any real fire scenario, it is highly unlikely the smoke will only enter one hole. As a result, ASD systems have a natural ability to detect "diluted" smoke in the space – the more dispersed or diffused the smoke becomes the more sampling holes it enters and the higher the effective sensitivity of the ASD becomes. This positive feature essentially reverses the natural dispersion and diffusion of smoke in a volume and is often referred to as the *cumulative effect*.

STANDARDS, APPROVALS AND TYPE TESTING

Unfortunately it has not proved practical to reflect the immense value of the cumulative effect within a relatively simple product type testing standard and it is a matter that must be addressed in the guides or Code of Practise currently being developed. However, the value of independent 3rd party verification of product performance cannot be disputed. Essentially, the aim of 3rd party testing is to demonstrate:

- reliability, repeatability, robustness (including environmental and EMC testing).
- performance in operation.

For ASD systems this has been done against type testing guidelines such as CEA 4022. This document (or derivative thereof) has been the cornerstone of ASD approval throughout much of Europe and has been the basis for the development of prEN54-20

By adopting the CEA standard, the tests for reliability, repeatability and robustness were largely defined and are based on the same requirements as EN54-7.

DEVELOPMENT OF FIRE TESTS

In relation to the Performance testing in operation, the new classification system required the development of some new "reduced" fire tests for the high sensitivity classes (A and B). Essentially, while the fires in EN54-7 and CEA 4022 are intended for standard point detectors and are therefore are suitable for Class C ASD systems, they cannot be used to verify the performance of enhanced (Class B) or high sensitivity (Class A) systems. Unfortunately, it is not practical to simply scale down the existing tests to produce less smoke due to the chaotic behaviour of smoke but a proposal to introduce forced movement of the air in the Fire test room using a simple duct and fan positioned about 1.5m above the fire was successfully developed into a new range of reduced tests. Based on extensive testing at CNPP in France, the members of TC72WG16 were able to define suitable fuel quantities and end-of-test conditions to correspond with the three classes A, B & C and these are the basis for prEN54-20.

The current question is whether these new fire tests result in detector classes that are truly useful to specifiers and installers in the field.

INSTALLED PERFORMANCE

In the case of point detectors, various prescriptive national standards/codes exist across Europe define clear recommendations on the frequency and positioning of "standard" point detectors. These recommendations for the spacing of point detectors are based on years of experience and an assumption that the detectors meet a minimum standard such as EN54-7.

These same prescriptive rules can be applied for Class C ASD systems because individual holes have been approved as meeting the minimum criteria for a point detector. Unfortunately, for Class A & B ASD systems the installation *rules* are not well defined. However, since such systems invariably provide better detection capability than normal Class C systems it is reasonable to space the holes in accordance with the rules for point detectors and be assured of meeting the minimum requirement. Where verification of the improved performance capabilities of class A & B systems is required the best option is to specify a performance test. This is where the Code of Practises really starts to show their value. For example, the BFPSA CoP defines the hot wire tests and a smoke pellet test which are often used to verify the performance of high sensitivity and enhanced sensitivity ASD systems. The CoP also provides advise on when and where to apply these (and other standard) performance tests by categorising the applications for every ASD application according to the sensitivity class, aspirating method (Primary , secondary or in-cabinet) and the primary drivers for its installation. It is anticipated that this catagorisation approach will assist those specifying ASD systems. Moreover, the BFPSA CoP includes standaredised forms for the various stages of an ASD project – from first enquiry through design, installation and commissioning. Theses forms will help UK companies in meeting their obligations under schemes such as the LPS1014 and BAFE SP203 by providing the process and tools for achieving a well designed and installed system.

Conclusion

The combination of a new product standard for ASD systems, prEN54-20, and related codes of Practise, such as the BFPSA CoP for ASD systems should help to maintain and improve the quality, reliability and performance of ASD systems. However, for their value to be maximised parties involved in the installation, commissioning and maintenance of ASD systems should take the opportunity to review and comment on these documents while they are still at the draft stage.

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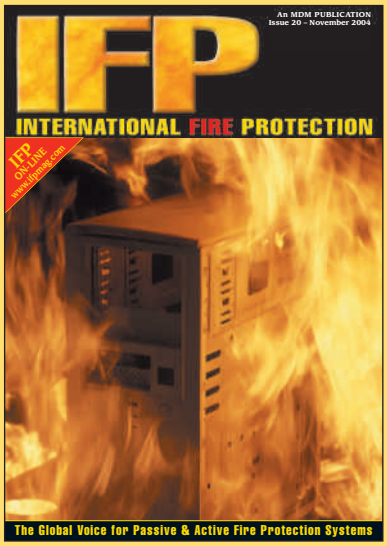

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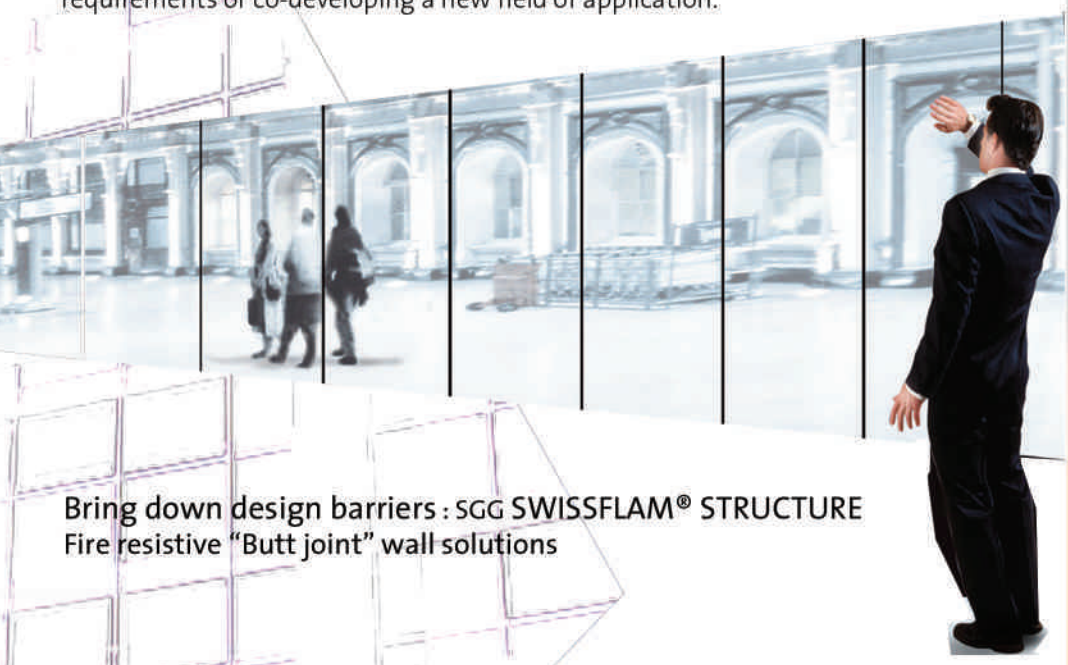

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* 67 Fed. Reg. 77927 (Dec. 20, 2002)

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